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NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE, --ETC(U)
SEP 81 W E BUSH DACW62-81-C-0056

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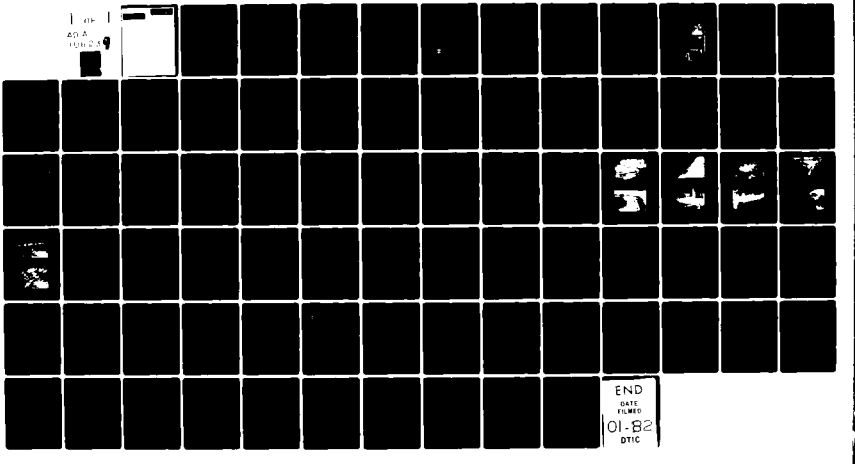

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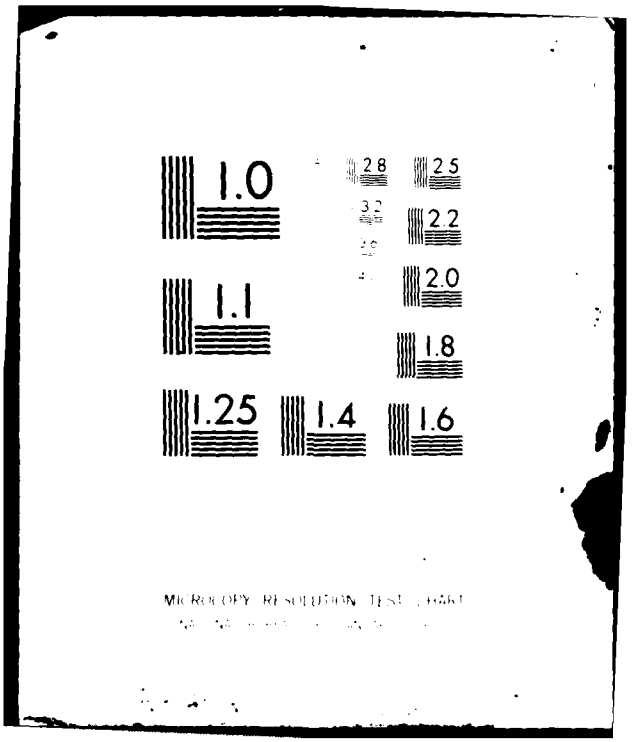
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REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A108 239	3. RECIPIENT'S CATALOG NUMBER
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Nolan Lake Dam, TN
Memphis, TN
Shelby County, TN
Embankments
Visual Inspection
Structural Analysis

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Nolan Dam has an 8.44 acre lake and is located in Shelby County, Tennessee, south of Winchester Road and east of Ross Road, and is an earth fill embankment 14.7 feet high and 640 feet long. The crest varies from 9 feet to 12 feet in width. Facilities for discharge from the reservoir are located in the east abutment and include an inlet section with a bottom width of eight feet and vertical broken concrete masonary walls two feet high. The emergency spillway is crossed by a farm road approximately 50 feet from the entrance and the fill contains four 18 inch corrugated metal pipes protected by a concrete headwall

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

on both sides of the road. A four inch cast iron draw down pipe with a gate valve at the discharge end is located at approximately the center of the dam. The enbankment slopes are approximately 1V on 3H on the downstream slope and vertical from the waterline to elevation 317 and 1V on 2.3H to the top of the dam on the upstream slope. Neither slope has undesirable vegetation. A broken concrete masonry wall provides the vertical section of the upstream slope. Nolan Dam is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and I by the State of Tennessee. On the basis of hydraulic analysis, Nolan Dam flood storage (40 acre-feet) and emergency spillway are inadequate to safely pass the 1/2 Probable Maximum Flood (PMF), which Office of the Chief of Engineers (OCE) Guidelines specify to be the design flood for a dam in the small size and high hazard categories. At this time, the dam is considered "Unsafe Non-emergency". It is recommended that a qualified engineer be engaged to: Recommend measures to the owner for removal and replacement of the upstream slope protection; determine the cause of seepage on the downstream slope and propose remedial measures; prepare a design of a spillway capable of passing the design flood; evaluate the stability of the dam with earthquake loading; develop an emergency action plan to alert downstream residents in the event a major problem develops with Nolan Dam, and develop a regular inspection and maintenance plan.

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202

IN REPLY REFER TO

ORNED-G

21 SEP 1981

Honorable Lamar Alexander
Governor of Tennessee
Nashville, TN 37219

Dear Governor Alexander:

Furnished herewith is the Phase I Investigation Report on Nolan Dam near Memphis, Tennessee. The report was prepared under the authority and provisions of PL 92-367, the National Dam Inspection Act, dated 8 August 1972.

The report presents details of the field inspection, background information, technical analyses, findings, and recommendations for improving the condition of the dam.

Based upon the inspection and subsequent evaluation, Nolan Dam is classified as unsafe-nonemergency due to insufficient storage and spillway capacity to pass the one-half probable maximum flood and questionable stability of the upstream slope.

We do not consider this an emergency situation at this time, but the recommendation concerning project modifications to allow safe passage of the design flood and others contained in this report should be undertaken in the near future to minimize the risk to the subdivision located immediately downstream.

Public release of the report and initiation of public statements fall within your prerogative. However, under provisions of the Freedom of Information Act, the Corps of Engineers is required to respond fully to inquiries on information contained in the report and to make it accessible for review on request.

Your assistance in keeping me informed of any further developments will be appreciated.

Sincerely,

Kenneth W. Ashley, LTC
for LEE W. TUCKER
Colonel, Corps of Engineers
Commander

1 Incl
As stated

CF:
Mr. Robert A. Hunt, Director
Division of Water Resources
4721 Trousdale Drive
Nashville, TN 37220

PHASE I INSPECTION

NOLAN DAM

SHELBY COUNTY, TENNESSEE

PREPARED BY:

WINSETT-SIMMONDS, CONSTERDINE & ASSOCIATES, INC.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TENNESSEE

Name of Dam	Nolan
County	Shelby
Stream	Tributary Nonconnah Creek
Date of Inspection	April 2, 1981

This investigation and evaluation report was prepared for the Tennessee Department of Conservation, Division of Water Resources by Winsett-Simmonds, Consterdine & Associates, Inc., P.O. Box 40045, Memphis, TN 38104.

Prepared By:

Wm. E. Bush, P.E., Director
Civil & Water Resources Engineering

ABSTRACT

Nolan Dam has an 8.44 acre lake and is located in Shelby County, Tennessee, south of Winchester Road and east of Ross Road, and is an earth fill embankment 14.7 feet high and 640 feet long. The crest varies from 9 feet to 12 feet in width. Facilities for discharge from the reservoir are located in the east abutment and include an inlet section with a bottom width of eight feet and vertical broken concrete masonry walls two feet high. The emergency spillway is crossed by a farm road approximately 50 feet from the entrance and the fill contains four 18 inch corrugated metal pipes protected by a concrete headwall on both sides of the road. A four inch cast iron draw down pipe with a gate valve at the discharge end is located at approximately the center of the dam.

The embankment slopes are approximately 1V on 3H on the downstream slope and vertical from the waterline to elevation 317 and 1V on 2.3H to the top of the dam on the upstream slope. Neither slope has undesirable vegetation. A broken concrete masonry wall provides the vertical section of the upstream slope.

Nolan Dam is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and I by the State of Tennessee.

On the basis of hydraulic analysis, Nolan Dam flood storage (40 acre-feet) and emergency spillway are inadequate to safely pass the ½ Probable Maximum Flood

(PMF), which Office of the Chief of Engineers (OCE) Guidelines specify to be the design flood for a dam in the small size and high hazard categories.

At this time, the dam is considered "Unsafe Non-emergency". It is recommended that a qualified engineer be engaged to: Recommend measures to the owner for removal and replacement of the upstream slope protection; determine the cause of seepage on the downstream slope and propose remedial measures; prepare a design of a spillway capable of passing the design flood; evaluate the stability of the dam with earthquake loading; develop an emergency action plan to alert downstream residents in the event a major problem develops with Nolan Dam; and develop a regular inspection and maintenance plan.

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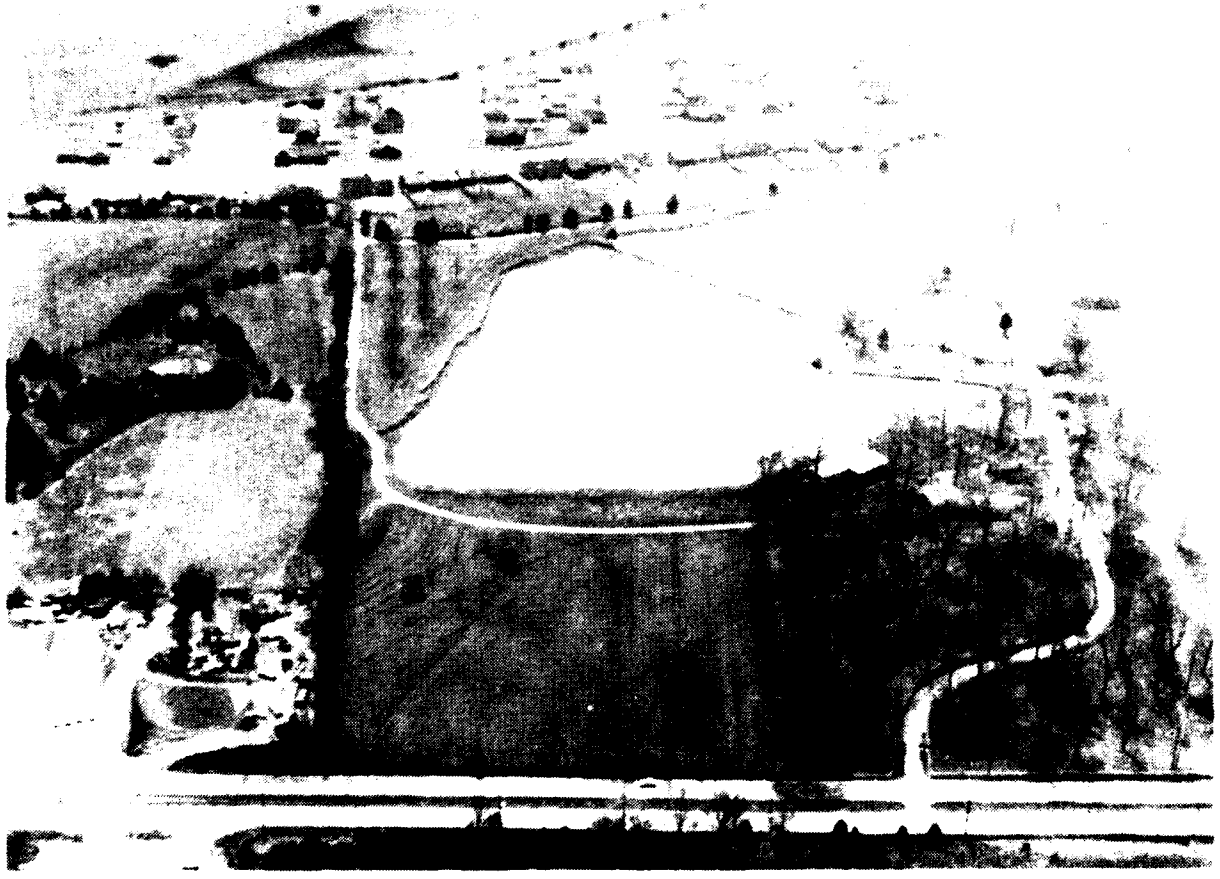


OVERVIEW PHOTO

PHASE I INSPECTION

NOLAN DAM

SHELBY COUNTY, TENNESSEE

SECTION 1 - GENERAL

1.1 Authority - The Phase I inspection of this dam was carried out under the authority of the Tennessee Code Annotated 70-2501 to 70-2530, "The Safe Dams Act of 1973", in cooperation with the Corps of Engineers under the authority of PL 92-367, "The National Dam Inspection Act".

1.2 Purpose and Scope - This report is prepared under guidance contained in Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I investigation. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The asessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analysis involving topographic mapping, subsurface investigation, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

Additional data or data furnished containing incorrect information could alter the findings of this report.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

1.3 Past Inspections - An inventory reconnaissance trip was made to Nolan Dam by the Division of Water Resources, State of Tennessee. (See Appendix F).

1.4 Miscellaneous Details - On the day of the Phase I inspection, the weather was fair with temperatures in the 80's and the wind was about 10 m.p.h. The level of the lake was slightly below the invert of the emergency spillway and approximately 4.2 feet below the effective crest.

1.5 Inspection Team Members - Field inspection was made by the following Winsett-Simmonds, Consterdine & Associates, Inc. personnel:

William E. Bush, P.E.

Dr. Fred H. Kellogg, P.E.

The team was accompanied by Messrs. George Moore and David Roe of the Tennessee Division of Water Resources.

SECTION 2 - PROJECT DESCRIPTION

2.1 Location - Nolan Dam is located in Shelby County, Tennessee in southeast Memphis. It can be located on USGS Map, "Germantown", at longitude 89°50'11" and at latitude 32°02'53".

2.2 Description

2.2.1 Embankment - The Nolan Dam is an earth embankment dam with an east-west orientation, a maximum height of 14.7 feet, and a length of 640 feet. The crest width is 9-12 feet. The upstream slope is vertical from the waterline to an elevation of 317.0, then averages 1V on 2.3H to crest elevation 319.2. The downstream slope averages 1V on 2.6H. The dam site is located near the eastern edge of the loess hills. The earth fill is a silty clay belonging to group "CL" in the unified system. Embankment sketches are provided is Exhibit B.

2.2.2 Service Spillway/Low Level Outlet - Nolan Lake does not have a service spillway, but does have a 4 inch cast iron pipe with a gate valve which is used as a drawdown pipe.

2.2.3 Emergency Spillway - The emergency spillway discharges through four corrugated steel pipes 18" in diameter set in a concrete headwall and its maximum capacity at the crest of the dam was calculated to be 60.5 cfs.

2.2.4 Reservoir and Drainage Area - The reservoir has a surface area of 8.44 acres at normal pool elevation with a fetch of 1050 feet. The normal impounding capacity of the reservoir is estimated to be 28.1 acre-feet with an additional 40.0 acre-feet of flood storage. The drainage area is 56 acres and the predominant soil is Grenada. Land use is 47 percent urban, 37 percent pasture, and 16 percent water.

2.2.5 Miscellaneous - No historical data was available at the time of inspection.

SECTION 3 - INSPECTION FINDINGS

3.1 Specific Findings

3.3.1 Embankment

Geology - Nolan Dam is located near the eastern edge of the loess hills that cover most of the high ground in the Memphis area. Terrace sands and gravel of the Lafayette formation underly the loess. The earth fill has been taken from the loess and is a silty clay bordering on silt, belonging to group "CL" in the Unified Classification System. The natural soil under the dam consists of similar material. From the bottom of the lake to the top of the terrace sands and gravels this loess soil is approximately ten feet thick.

Abutments - No signs of erosion at the contact of the embankment with either abutment were found. There was no evidence of springs nor indications of seepage along the contact points with the embankment and the abutments.

Upstream Slope - A broken concrete masonry wall approximately 2 feet high above the water level extends all around the slope and past both abutments. Above this the wall the slopes vary from one vertically on three horizontally to one vertically on two horizontally or steeper. Stones have been washed out of the wall and the wall is being undermined by wave action all along its length. Sloughing immediately behind the wall extends generally all along the wall. Longitudinal cracks

have formed at the upper edge of this sloughed area and several holes were observed in the sloughed area. As the wall foundation is being undermined, the soil behind the wall fails and is being washed out. (See Photograph No. 3). At approximately Station 4 + 50, an eight inch stump is protruding from the side of the wall. The foundation and lower floor of a house has been built in the embankment west of the center of the dam. Small pipes extend from the house through the embankment discharging on the upstream slope. There was no sign of discharge at the time of inspection. West of the house, an eight inch pipe passes through the embankment and serves as a culvert. Vines and another stump are growing in the side of the masonry wall here.

Crest - The crest is generally ten to twelve feet wide with a good grass cover that is well maintained. A few holes were noted that were made by boring animals on the downstream edge. At the middle of the dam at approximately Station 3 + 15, the crest has been widened to some 15 to 30 feet. This widening was apparently done after the original dam was constructed and is approximately 30 feet in length along the top of the crest.

Downstream Slope - The downstream slope approximates about one vertically on three horizontally. It is well covered with grass and appears generally smooth. One 24 inch tree was noted on the slope east of the house. Some rilling was found under the grass but does not appear to be serious. Its extent was difficult to

determine due to the thick grass cover and the dead grass clippings from the last mowing. At Station 3 + 15, the slope is steeper than elsewhere, apparently from dumping additional fill on the downstream slope. This, too, was covered with grass. From a point approximately six feet above the road to 12 feet above the road, water is seeping from the face of the slope and the ground is soft and very wet. This seepage is very difficult to see because it is covered with the dead grass from previous mowings as well as live grass. The amount of water seeping is removed by evaporation before it can reach the toe of the dam. At the upper end of the seep which is at the bottom of the additional fill placed on the slope, there is a depression. Otherwise no other signs of erosion from this seepage were found. The wet area is only 3 or 4 feet wide parallel to the access road of the dam. Sloughing was noted in the top 6 feet of the slope. (See Photograph No. 9).

Area Below Downstream Toe - In the area downstream from the embankment, no depressions, sinkholes, piping, boils, or lush growth indicating seepage was observed.

3.1.2 Seismic Zone - Nolan Dam is located in Seismic Zone 3. No record of any stability analysis could be found.

3.1.3 Spillways - Nolan Dam does not have a service spillway. Near the center of the embankment and on the north side of the road

that parallels the dam, a four inch cast iron pipe was found; this pipe is used to draw down the impoundment and is controlled by a gate valve located at the downstream end. The valve leaked slightly leaving a small pool of water. The pipe extends through the dam with a vertical section in the lake to serve as an intake. This intake was below the water surface and could not be inspected. The caretaker stated that this gate valve was operated last year and was in an operable condition. No signs of leakage were noted along the sides of the pipe. The ditch in which the pipe discharges was dry and well covered with grass. This ditch drains north to Winchester Road.

The emergency spillway is located in the east abutment. This spillway is a rectangular spillway with both sides of the entrance channel protected by broken concrete masonry walls. The bottom appears to be earth. No control section was noted. A farm road crosses the emergency spillway approximately 50 feet from the entrance and the fill contains four 18 inch corrugated metal pipes. These pipes act as a control for the emergency spillway. The pipes were partially obstructed by dirt, weeds, and other debris and are subject to complete stoppage by debris build up. Both the upstream and downstream ends of the pipe are protected by a concrete headwall. The outfall ditch below the roadway is grown up with small trees, tall grass, and other vines.

3.1.4 Downstream Inspection and Hazard Classification - The downstream hazard potential classification for Nolan Dam is high. Winchester Road is located approximately 500 feet downstream from the dam. A newly developing subdivision is located approximately 1000 feet below the dam. This subdivision has seven houses completed in the floodway through the subdivision and several lots are available for building. These buildings are in the floodway and would be damaged in the event of a dam failure.

3.1.5 Hydrology and Hydraulics - According to O.C.E. Guidelines, dams with a high hazard, small size classification should have storage and spillway capacity to pass the ½ to full PMF without overtopping the dam. The Probable Maximum Precipitation (PMP) is 29.8 inches in 6 hours, yielding 28.92 inches of runoff. Time of concentration was estimated to be 0.49 hours and flood storage from normal pool to the low point of top of dam is estimated to be 32.0 acre-feet. Routing of the ½ PMF (Antecedent Moisture Condition II), produced a peak outflow of 167 cfs which overtopped the dam a maximum of 0.2 feet. The total period of flow over the dam was 4 hours.

The 100-year, 6-hour (AMC III), flood was routed through the structure. The 100-year, 6-hour precipitation was 5.6 inches. The Nolan Dam contained this storm with a flow of 2.3 feet in the emergency spillway and a freeboard of 1.9 feet.

3.2 Conclusions and Recommendations

3.2.1 Conclusions

a. Hydraulic analysis indicates that the Nolan Dam spillway is inadequate to pass the design flood. Outflow resulting from the ½ PMF will overtop the dam a maximum of 0.2 feet with a total duration of 4 hours.

b. On the basis of engineering judgment and visual observations, the upstream slope appears unstable due to wave action undermining the broken concrete masonry wall and subsequent movement of soil immediately behind the wall.

c. On the basis of engineering judgment, the wet area observed on the downstream slope may possibly be corrected by removing the broken concrete masonry wall and improving the upstream slope.

d. Nolan Dam is in Seismic Zone 3. Stability analysis of the embankment with earthquake loading is not within the scope of this report.

e. The location of the gate valve at the outlet end of the 4 inch drawdown pipe is undesirable in that pressure is maintained in the pipe at all times and any leakage from the pipe within the fill could cause a structural failure.

f. Nolan Dam is considered as "Unsafe-Non-emergency" because it is a dam with obviously serious deficiencies which clearly could develop or are developing into failure modes but do not yet pose the threat of immediate failure.

3.2.2 Recommendations - The owner should keep the wet area on the backslope of the dam under close observation for changes in area and flow until remedial work is begun. Consideration should be given to methods and length of time required to draw down the impoundment. A qualified engineer should be retained to:

a. Recommend measures to the owner for the removal and replacement of the upstream slope protection.

b. Determine the cause of seepage in the downstream slope and propose remedial measures.

c. Prepare a design to either enlarge the present spillway or design a new spillway capable of carrying the ½ PMF without overtopping the dam.

d. Evaluate the stability of the dam with earthquake loadings.

e. Develop a regular program of inspection and maintenance of the embankment and spillway on at least an annual basis.

f. Develop an emergency action plan to alert downstream residents in the event a major problem develops with Nolan Dam.

g. Design modification to drawdown pipe to change valve to upstream end of pipe.

In addition, the owner should:

a. Cut weeds and clear debris from spillway entrance and exit channel and pipes.

b. Test the drawdown facility twice yearly to ensure its serviceability.

SECTION 4 REVIEW BOARD FINDINGS

The Interagency Review Board for the National Program of Inspection of NonFederal Dams met in Nashville on 16 July 1981 to examine the technical data contained in the Phase I investigation report on Nolan Dam. The Review Board considered the information and recommended that (1) the owner immediately clean out the debris in the spillway and outlet channel, and (2) the valve control on the 4-inch drowdown pipe should be moved to the upstream end so that full reservoir pressure is not present on the pipe beneath the embankment. They agreed with other report conclusions and recommendations. A copy of the letter report presented by the Review Board is included in Appendix H.

APPENDIX A

DATA SUMMARY SHEET

APPENDIX A
DATA SUMMARY SHEET

A.1 DAM - Nolan Dam

A.1.1 Type - Earth Fill

A.1.2 Dimensions and Elevations - Elevations were determined by assuming an elevation for the top of the west emergency spillway headwall based on the USGS quadrangle map, "Memphis SE".

a.	Crest length	640 feet
b.	Crest width	9-12 feet
c.	Height	14.7 feet
d.	Crest elevation	319.2 feet
e.	Service spillway elevation	N/A
f.	Emergency spillway elev. left	N/A
g.	Emergency spillway elev. right	315.0 feet
h.	Embankment slope, U/S (above wall to crest)	1V on 2.3H
i.	Embankment slope, D/S (from lower slope to crest)	1V on 2.6H
j.	Size classification	Small

A.1.3 Zones, Cutoffs, Grout Curtains — None

A.1.4 Instrumentation — None

A.2 RESERVOIR AND DRAINAGE AREA

A.2.1 Reservoir - (Normal pool elevation 315.0, 4.2 feet below the effective crest).

a.	Surface area	8.44 acres
b.	Length of pool	1050 feet
c.	Capacity (Normal pool)	28.1 acre-feet (est.)
d.	Maximum surface area	10.6 acres
e.	Flood storage	40.0 acre-feet

A.2.2 Drainage Area

a. Size - 56.01 acres (.09 square miles)
b. Characteristics:
Average watershed slope - 1.7%
soil - Grenada
cover - 47%, urban; 37%, pasture; 16%, water.

c.	Runoff PMF (AMC II)	28.92 inches
d.	Runoff ½ PMF (AMC II)	14.46 inches
e.	Runoff P_{100} (AMC III)	5.37 inches

A.3 OUTLET STRUCTURES

A.3.1 Drawdown Facilities - 4 inch cast iron pipe with gate valve on outlet end at elevation 302.3 MSL.

A.3.2 Emergency Spillway

a.	Crest elevation	315.0 feet
b.	Side slope (left)	Vertical
c.	Side slope (right)	Vertical
d.	Depth	4.? feet
e.	Bottom width	7.0 feet
f.	Maximum capacity	60.5 cfs
g.	Control	4-18 inch CM pipes

A.3.3 Spillway (Right abutment)

A.4 HISTORICAL DATA

A.4.1	Construction Date	1948
A.4.2	Designer	Mr. Cook, Whitehaven, TN
A.4.3	Builder	Mr. Cook, Whitehaven, TN
A.4.4	Owner	Mr. J. J. Nolan
A.4.5	Previous Inspection	No previous inspection
A.4.6	Seismic Zone	3

A.5 DOWNSTREAM HAZARD DATA

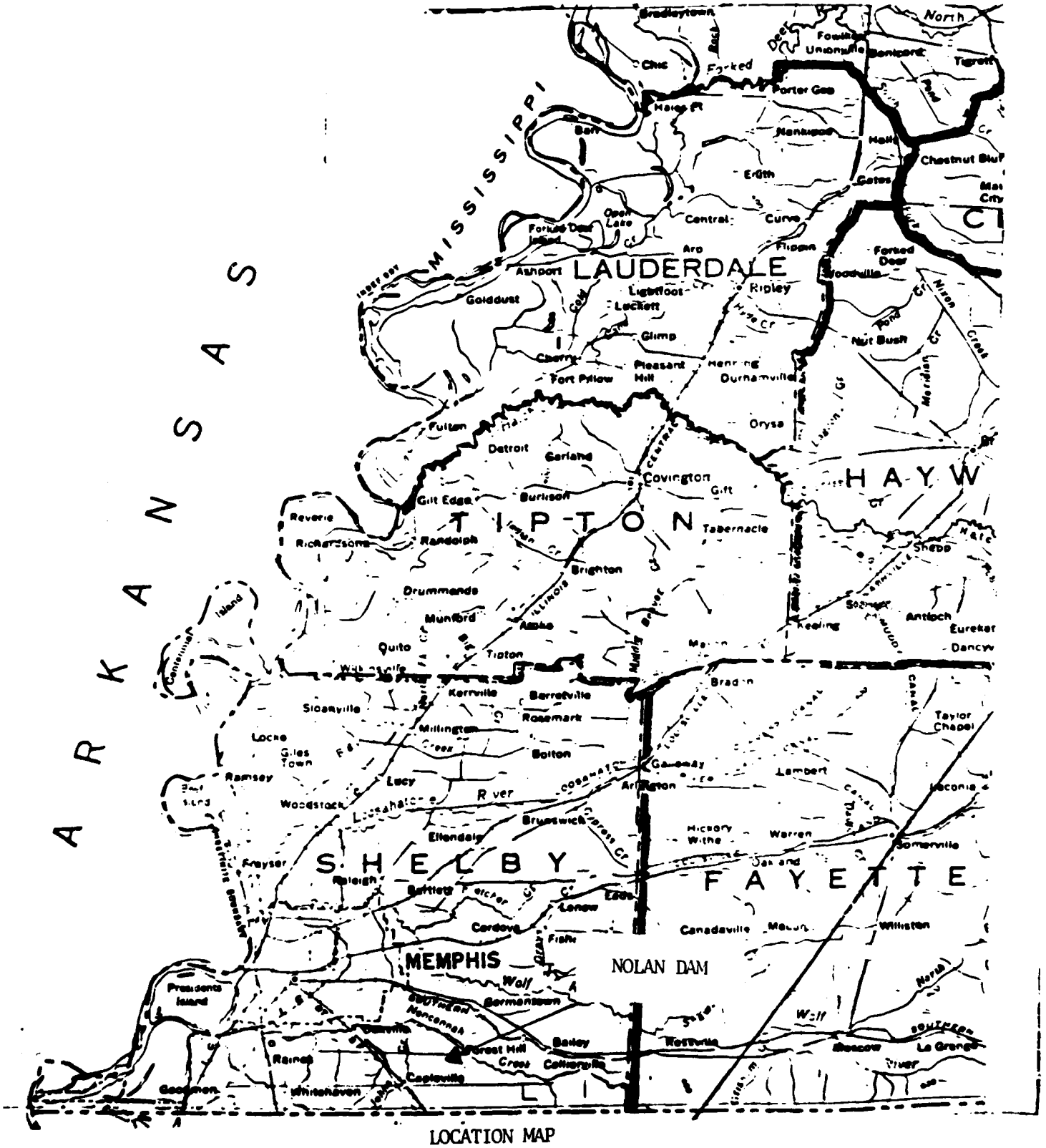
A.5.1 Downstream Hazard Potential Classification

a.	Corps of Engineers	High
b.	State of Tennessee	I

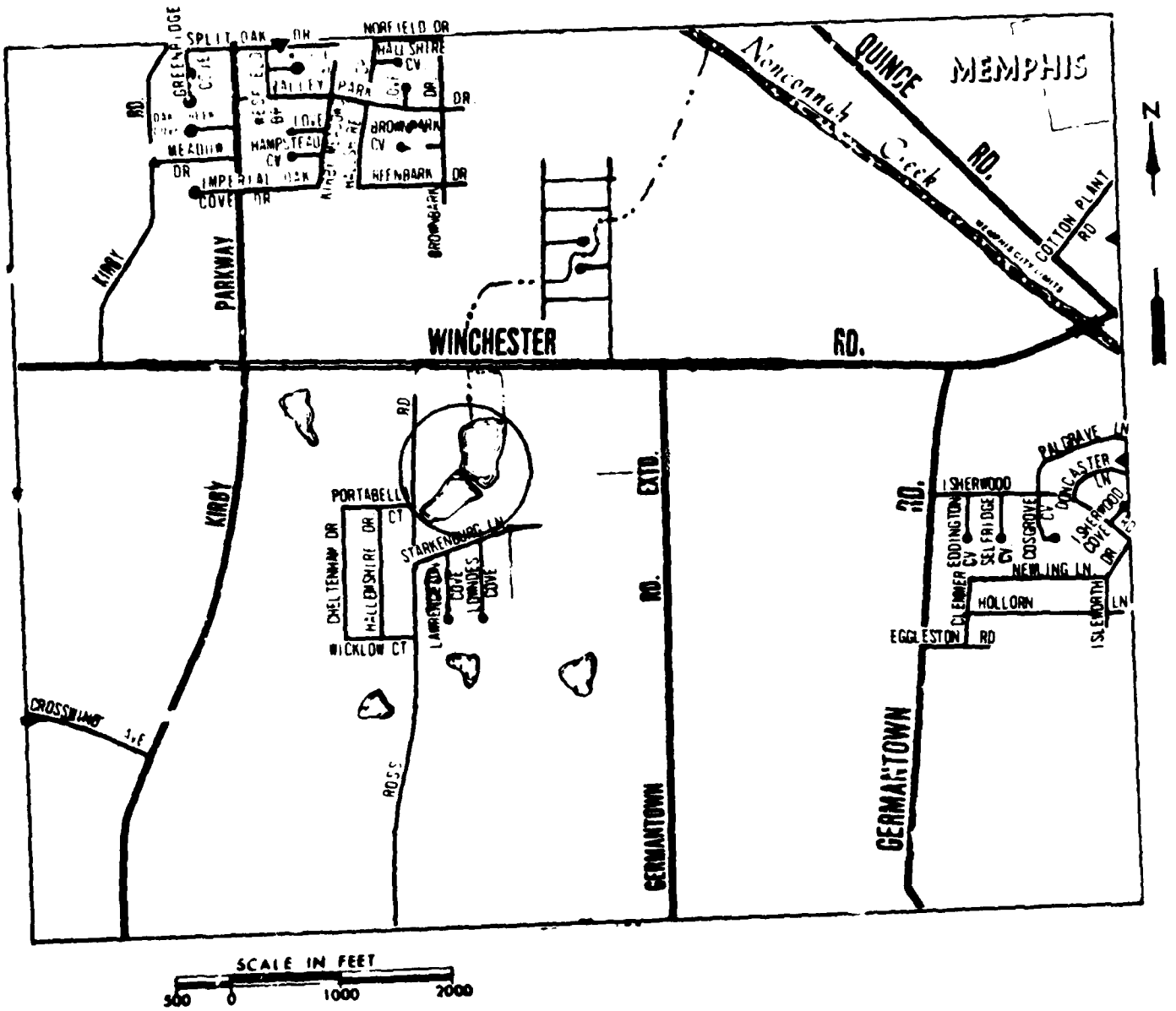
A.5.2	Persons in Probable Flood Path	20 persons
A.5.3	Downstream Property	Winchester Road & 7 houses
A.5.4	Warning Systems	None

APPENDIX B

SKETCHES AND LOCATION MAPS

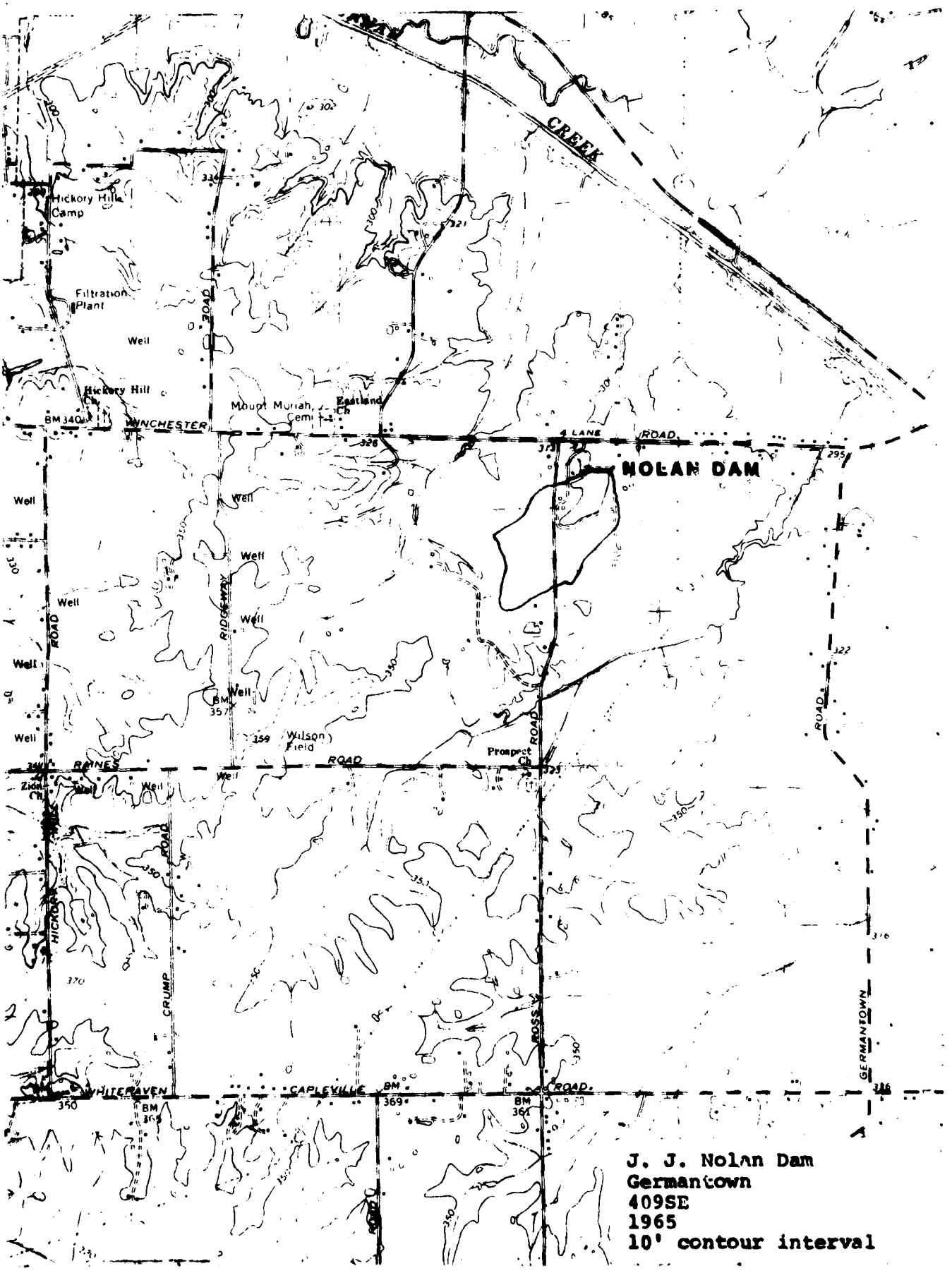


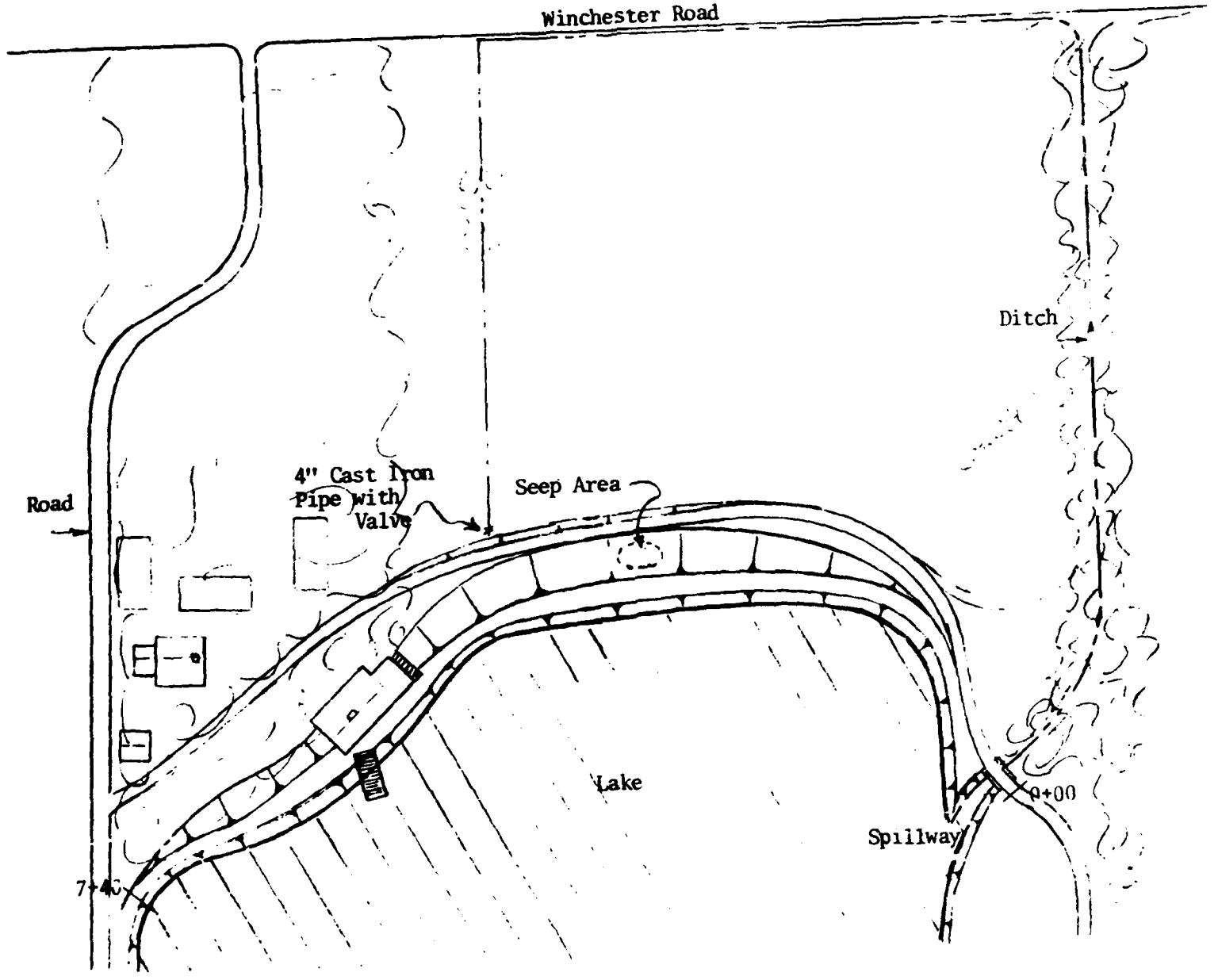
LOCATION MAP
NOLAN DAM



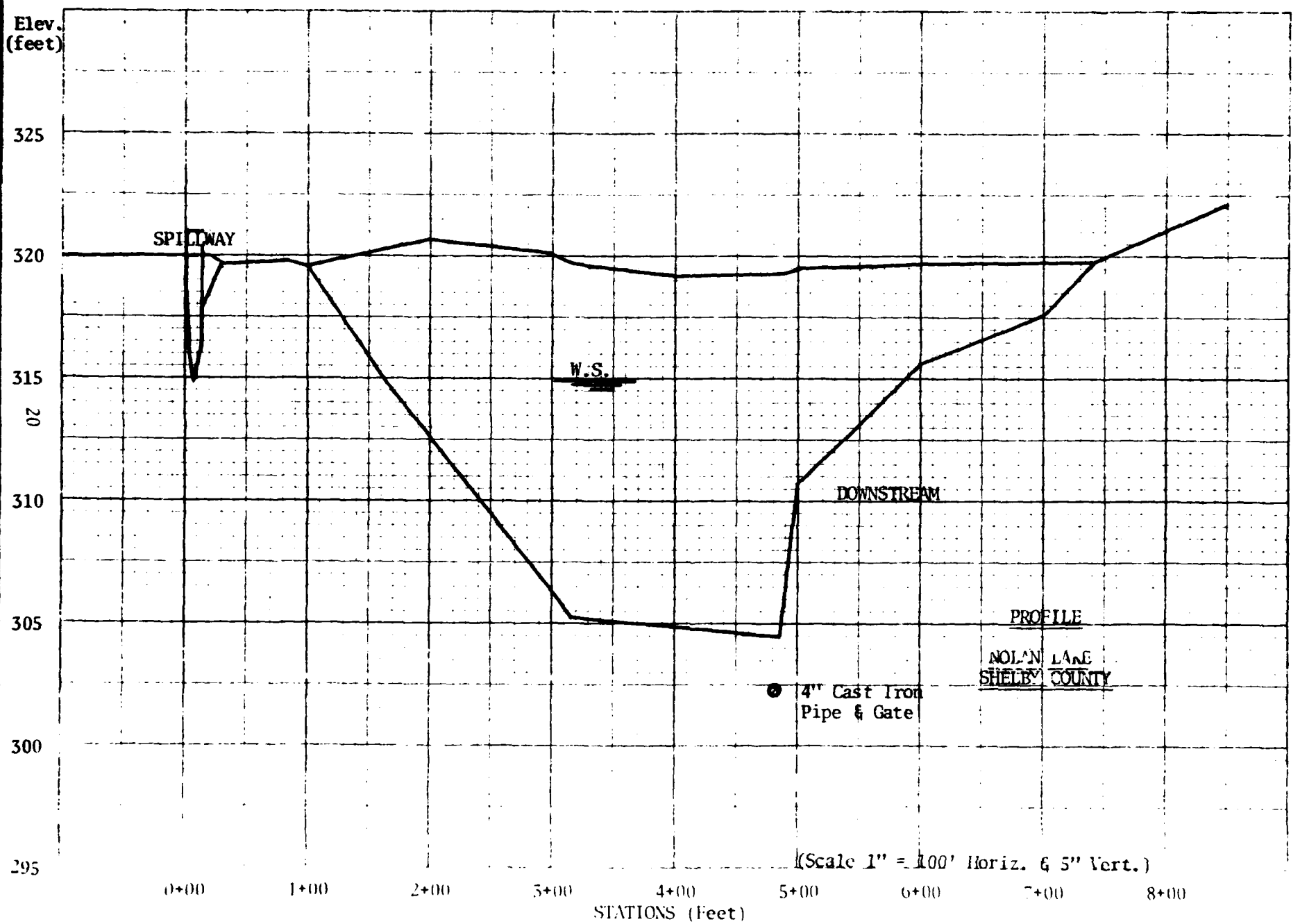
SITE MAP

NOLAN DAM


CREEK
Hickory Hill Camp
Filtration Plant
Well
Hickory Hill Ch
Mount Moriah Cem
Eastland Ch
BM 340
WINCHESTER
4 LANE
ROAD
NOLAN DAM
Well
RIDGEWAY
ROAD
BM 357
Wilson Field
Prospect Ch
RAINES
HICKORY
CRUMP
ROSS
GERMANTOWN
WHITEHAVEN
CAPLEVILLE
BM 369
BM 361
BM 350
J. J. Nolan Dam
Germantown
409SE
1965
10' contour interval



PLAN
(not to scale)


Elev. (feet)
325
320
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310
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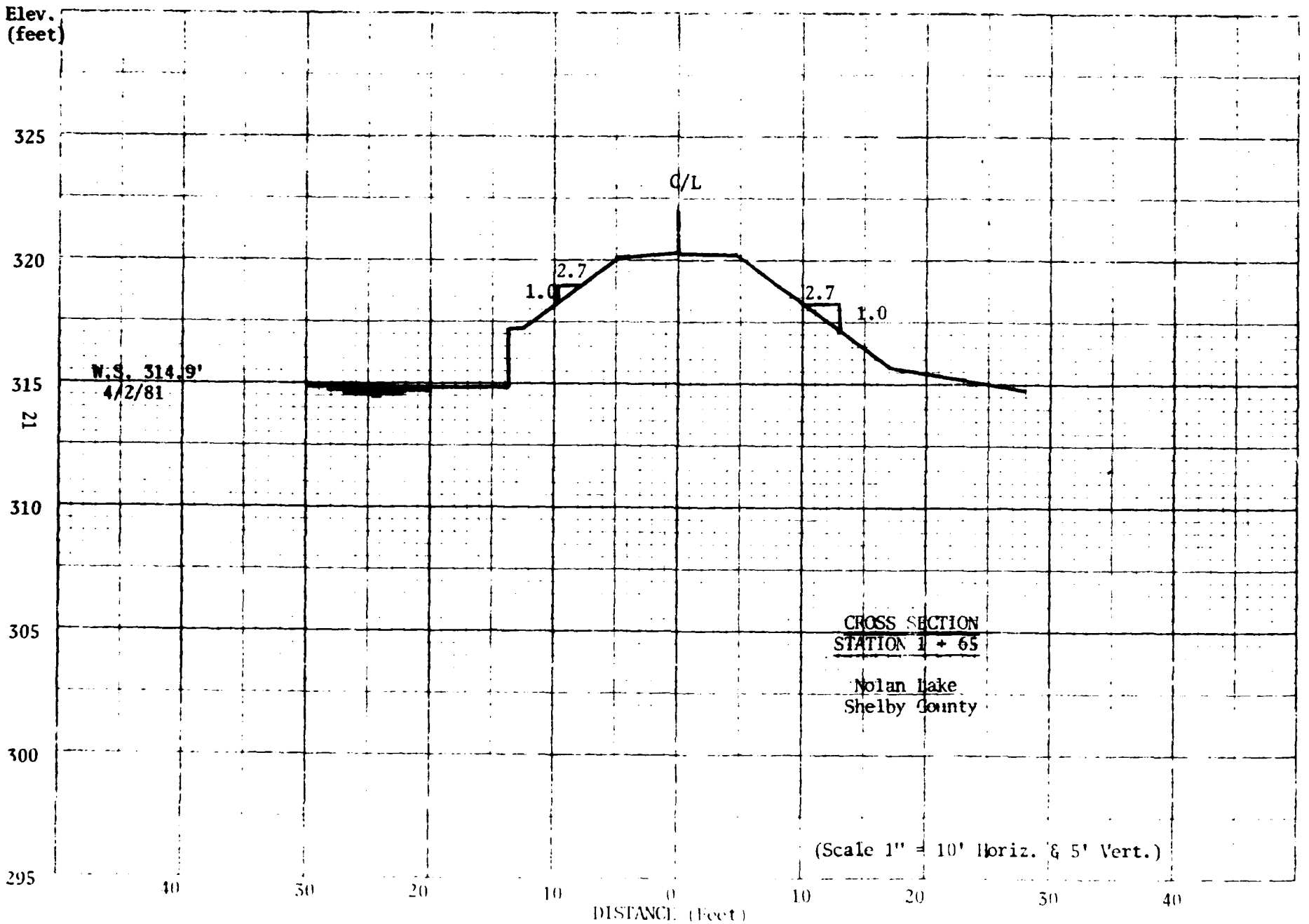
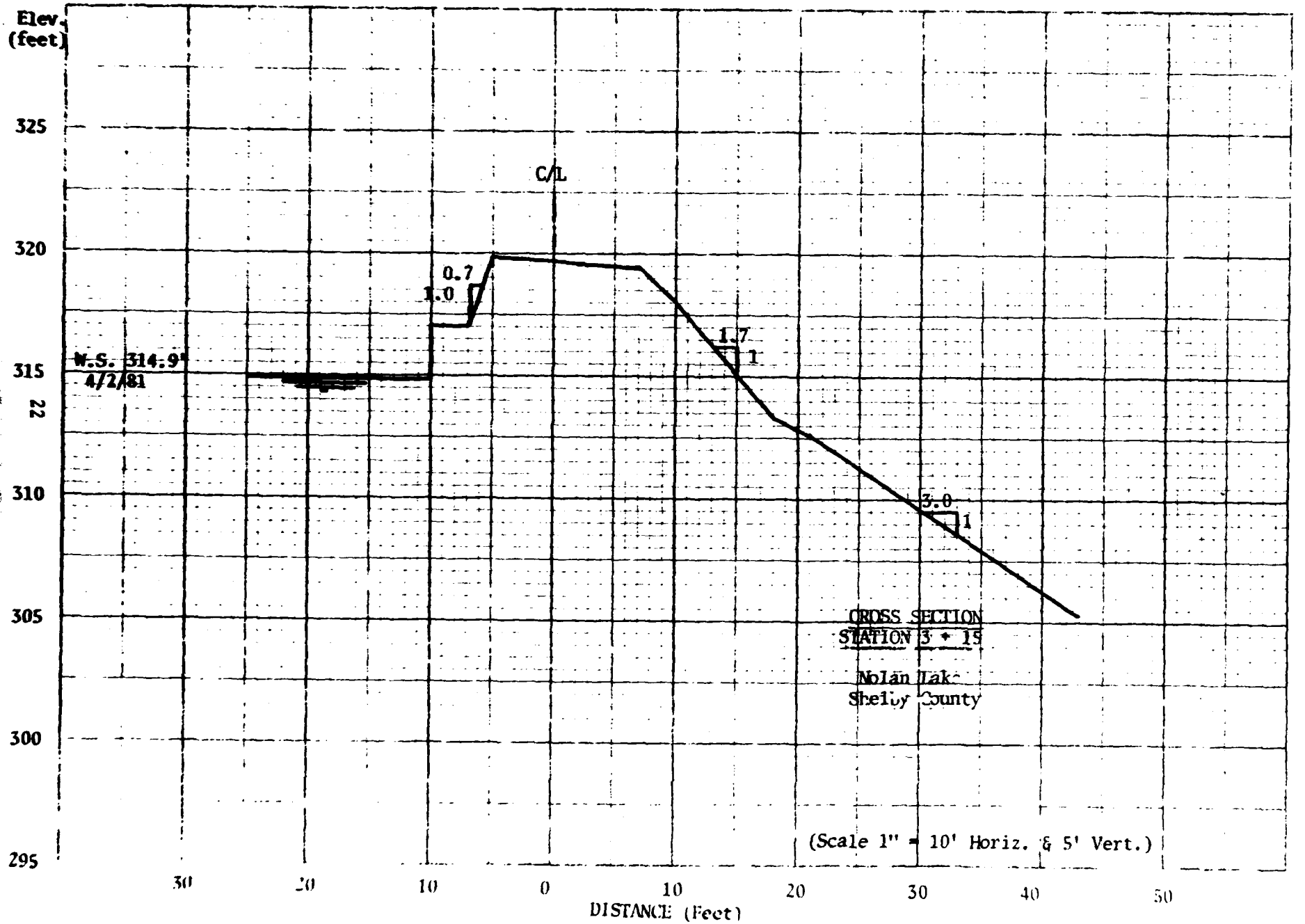
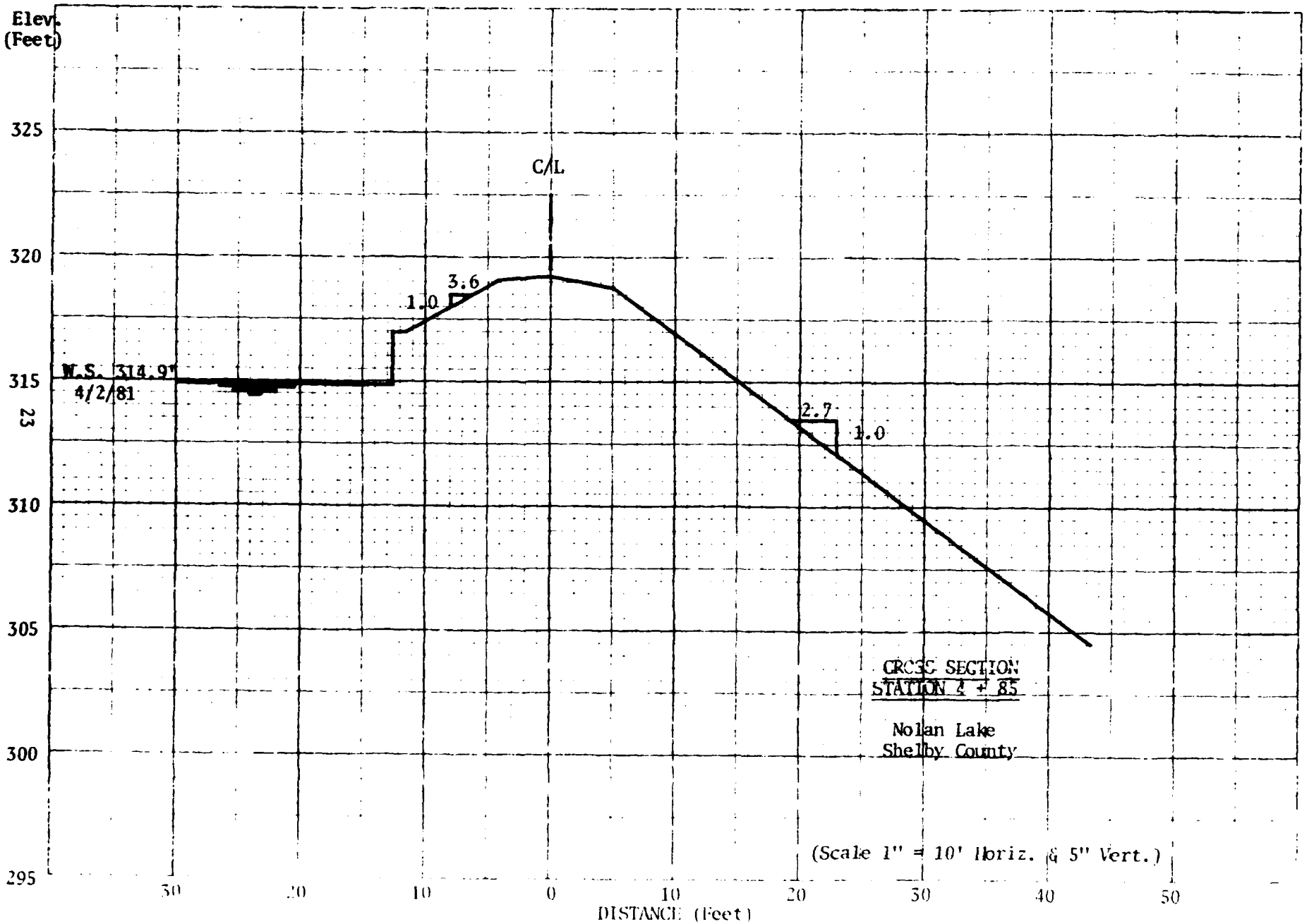
SPILLWAY
W.S.
DOWNSTREAM
PROFILE
NOLAN LANE
SHELBY COUNTY
4" Cast Iron Pipe & Gate
(Scale 1" = 100' Horiz. & 5" Vert.)
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
STATIONS (Feet)


Elev. (feet)
325
320
315
310
305
300
295
C/L
2.7
1.0
2.7
1.0
W.S. 314.9'
4/2/81
21
40
30
20
10
0
10
20
30
40
DISTANCE (Feet)
CROSS SECTION
STATION 1 + 65
Nolan Lake
Shelby County
(Scale 1" = 10' Horiz. & 5' Vert.)

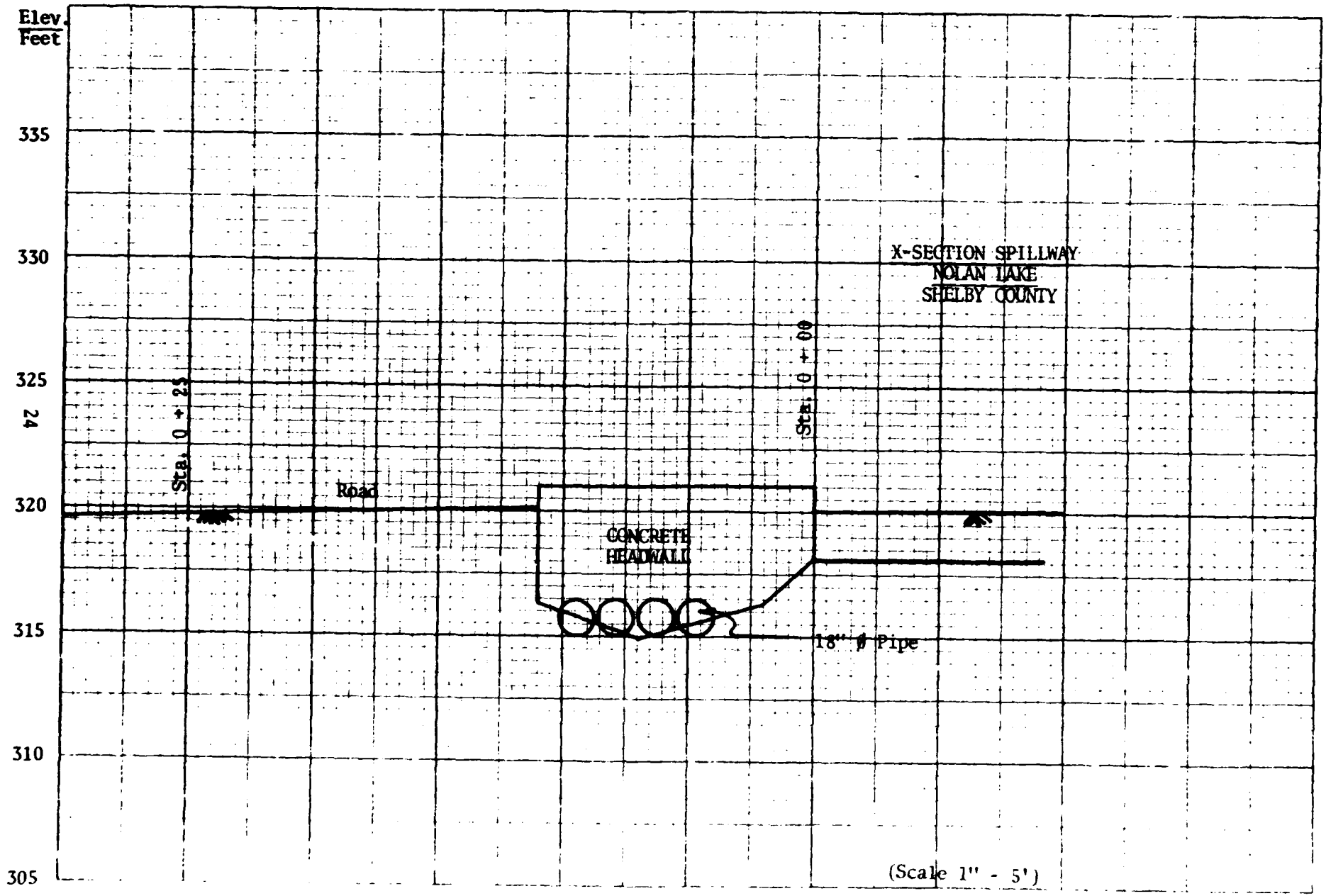

Elev.
(feet)
325
320
315
310
305
300
295
C/L
0.7
1.0
1.7
1
3.0
1
W.S. 314.9'
4/2/81
22
30
20
10
0
10
20
30
40
50
DISTANCE (Feet)
CROSS SECTION
STATION 3 + 15
Nolan Lake
Shelby County
(Scale 1" = 10' Horiz. & 5' Vert.)



CROSS SECTION
STATION 2 + 85

Nolan Lake
Shelby County

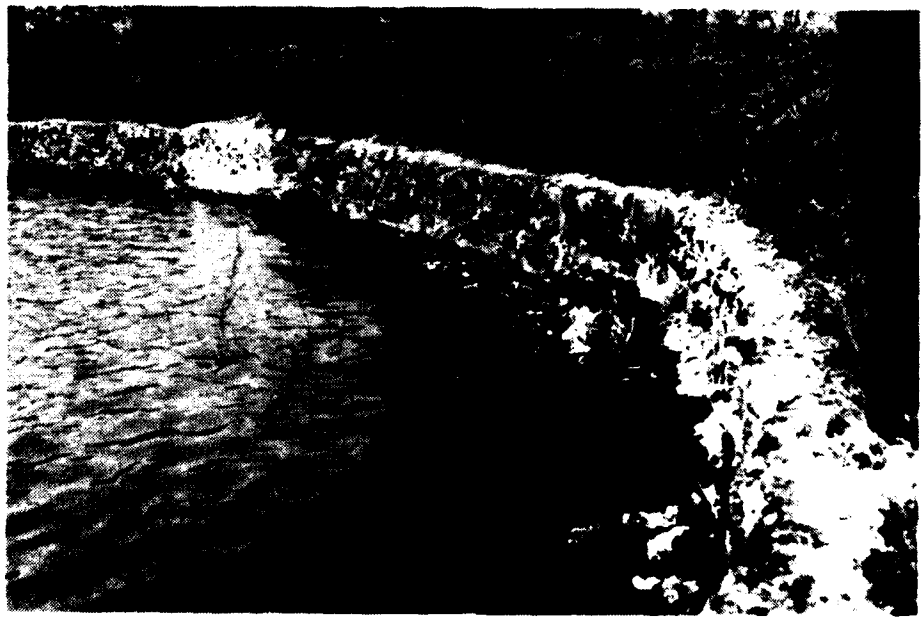
(Scale 1" = 10' Horiz. & 5" Vert.)


Elev.
Feet
335
330
325
320
315
310
305
X-SECTION SPILLWAY
NOLAN LAKE
SHELBY COUNTY
Sta. 0 + 25
Sta. 0 + 00
Road
CONCRETE
HEADWALL
18" ϕ Pipe
(Scale 1" - 5')
DISTANCE (Feet)

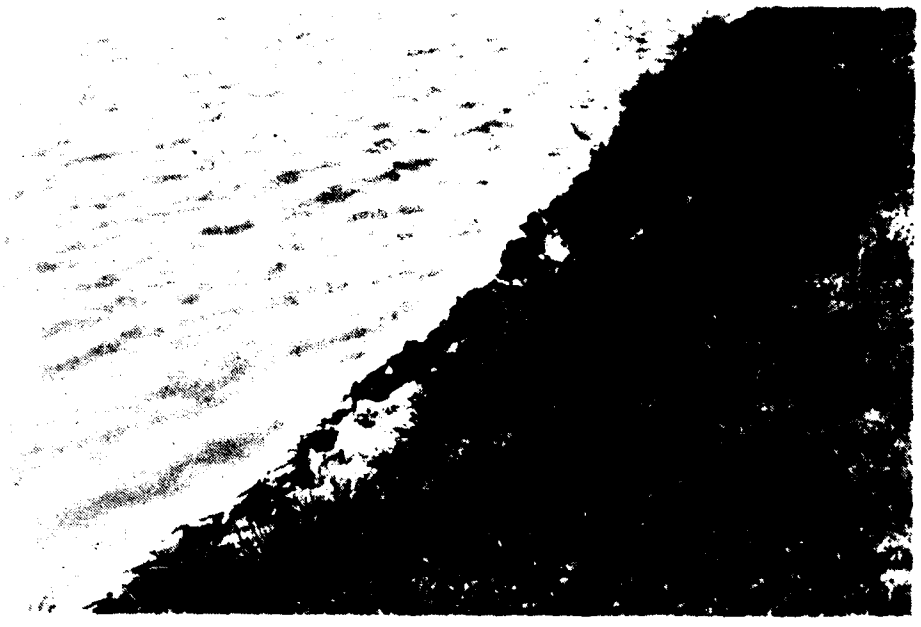
APPENDIX C

PHOTOGRAPHIC RECORD

1. Backslope - Nolan Dam. Seep located generally within area bounded by high weeds.

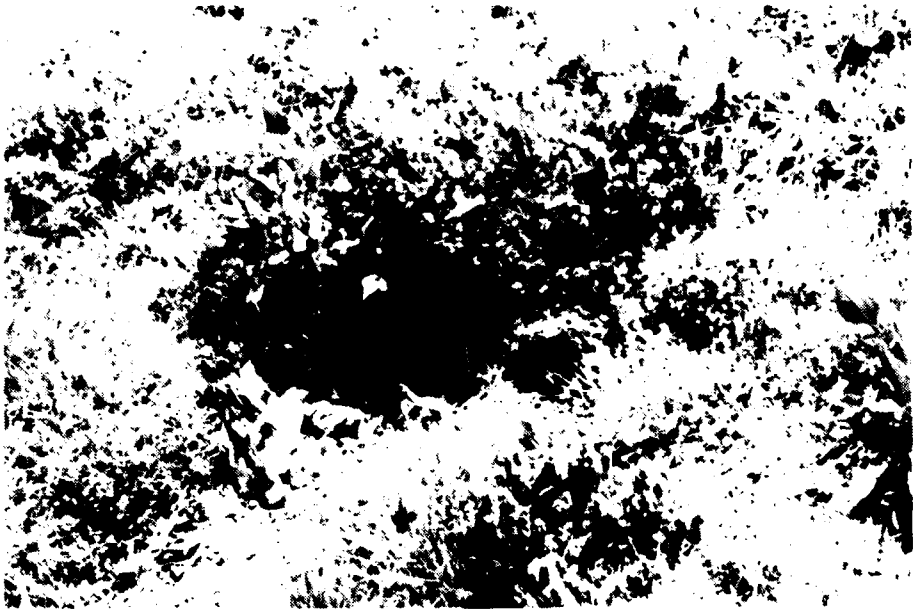


2. Upstream slope - Nolan Dam. Note masonry wall and patched areas. Also undercutting of foundation.



3. Typical failures along top of masonry wall on upstream slope of Nolan Dam.

4. House with foundation and lower floor built into downstream slope of Nolan Dam.



5. Gate valve on 4 inch cast iron pipe. Drawdown pipe - Nolan Dam.

6. Entrance to emergency spillway in right abutment - Nolan Dam.

7. Four 18 inch CM pipes under farm road that controls discharge through emergency spillway - Nolan Dam.

8. Outfall ditch for emergency spillway discharge - Nolan Dam.

9. Backslope - Nolan Dam. Wet area in high weeds at center photograph. Drawdown pipe outlet of left side of picture where man is standing.

10. Close-up of wet area on backslope.

APPENDIX D

INSPECTION TEAM TRIP REPORTS

TRIP REPORT
NOLAN DAM
SHELBY COUNTY, TENNESSEE

GENERAL ENGINEERING OBSERVATIONS
April 2, 1981

GENERAL. An engineering inspection of the Nolan Dam located in Shelby County, Tennessee was made with Dr. Fred H. Kellogg of Kellogg Engineering, George Moore, and David Roe of the Tennessee Division of Water Resources on April 2, 1981.

The weather was fair and the temperature was 80 degrees. Wind was estimated at 10 m.p.h. with gusts to 15 m.p.h. The water level at the time of inspection was slightly below the invert of the emergency spillway and approximately 5 to 6 feet below the crest of the dam.

EMBANKMENT. (Exhibit B). The crest of the embankment is crescent-shaped with an east-west orientation and the dam appears to be made of compacted earth fill with a top width varying from 10 to 12 feet in width. The downstream slope is covered with a good fescue and bermuda grass sod that is apparently maintained. There are longitudinal surface cracks running immediately behind the rock wall revetment in a number of places. One area of the crest has the appearance of having possibly failed due to overtopping in the past and has been repaired. The upstream slope has a broken concrete masonry wall running the entire length of the dam for wave protection. The foundation of the masonry wall has been undercut in many places. This

undercutting has caused dirt to leach out from behind the wall and has caused a failure of the slope immediately behind the wall. The owner's representative noted that this wall has to be repaired every year and apparently wave action causes this undercutting. There are two 6 inch tree stumps projecting from the masonry wall that should be removed. The downstream slope has an excellent cover of fescue and other grasses and is being maintained. There is one spot near the center of the dam approximately 30 feet wide that has the appearance of an overtopping failure that has been repaired. In the repaired area, wet soil was found approximately 8 to 9 feet below the crest of the dam. The saturated area did not show evidence of piping through the structure, but more of a plane of seepage. No toe drain system was found in this dam. The abutments of the dam appear to be in excellent condition with no erosion of the contact of the embankment with the abutment, nor was there evidence of springs or indications of seepage along the contact points. The area downstream from the embankment had no depressions, sinkholes, piping, or boils nor any lush growth to indicate such seepage.

There is no service spillway for Nolan Dam. A 4 inch cast iron drawdown pipe extends through the dam with a vertical intake pipe in the lake with the top below the water surface. Since the top of the intake was below the water surface, it could not be observed. The outlet end of the 4 inch pipe has a gate valve and it appears in operable condition. It should be noted that with the gate valve located at the outfall end, the pipe is

always under pressure and subject to joint and other pipe failures. No signs of leakage were observed at the gate valve or around the pipe. The emergency spillway is located in the east abutment. This spillway has vertical sidewalls protected by broken concrete masonry walls. The bottom appears to be earth. No definite control section was observed during this inspection. Discharge through the emergency spillway is controlled by four 18 inch corrugated metal pipes that pass under the roadway across the spillway. The area above the broken concrete masonry walls is vegetated with fescue, bermuda grass, and is maintained. The exit channel below the roadway is an earth channel grown up with grass, weeds, small saplings, and trees. Within the area immediately downstream from the dam is Winchester Road. The drainageway then continues northwardly to a developed subdivision which contains a minimum of 6 to 7 houses adjacent to the drainageway that have been completed and are now occupied.

CONCLUSIONS. Except for the upstream slope, Nolan Lake Dam appears to be stable at this time. The seepage on the downstream slope should be watched for further deterioration and if such is noted, an engineering study should be made to repair it. In the event of the Nolan Dam failure, there is good probability that the above houses in the subdivision downstream would be inundated.

RECOMMENDATIONS. I would recommend that the upstream retaining walls be removed and an engineer employed to redesign an upstream protection that could possibly include restoring the slope, filter cloth, and riprap to

adequately protect the upstream slope. At the same time, the backslope should be studied to determine the exact cause of the seepage. The emergency spillways will also need to be redesigned to handle a flood of the magnitude of ½ PMF.

Wm. E. Bush

William E. Bush, P.E., Director
Civil and Water Resources Engineering
TN License No. 4177

NOLAN LAKE DAM
INSPECTION

INTRODUCTION. This earth dam is located near the intersection of Winchester Road with Ross Road, a short distance east of the Memphis city limits, at the head of a small tributary of Nonconnah Creek. The dam is about 20 feet high, oriented east and west with the reservoir to the south. The dam was inspected on 2 April 1981.

GEOLOGY AND SOIL PROFILE. The dam is located near the eastern edge of the loess hills that cover most of the high ground in the Memphis area. The terrace sands and gravels of the Lafayette Formation underlie the loess. The top of the terrace deposits is about 10 to 35 feet below the surface of natural ground, depending on the elevation of the surface. The earth fill has been taken from the loess, and is a silty clay bordering on silt, belonging to group "CL" in the Unified Classification System (Figure 1). The natural soil under the dam consists of similar material. From the bottom of the lake to the top of the terrace sands and gravels, this loess soil is about 10 feet thick.

Spillway. The emergency spillway is located just beyond the east abutment. It is seven feet side at the crest and discharges through two corrugated steel pipes 18 inches in diameter, set in a concrete headwall. The water level at the time of inspection was a few inches below the pipe invert, and 4.5 feet below the crest of the dam. There is no protection from clogging of the 18 inch pipes. The outfall channel is a trapezoidal ditch about three feet wide at the base and about seven feet wide at the top. The channel has a good grass cover. It leads the water northward

to the thalweg of the natural watercourse.

CREST. The crest is about ten feet wide, with a good grass cover. No longitudinal or transverse cracks were found. A few holes made by boring animals were found along the downstream edge. The crest bends to the west a short distance from the spillway. Near the middle of the dam, the crest has been widened to 15 to 30 feet, apparently from an attempt to repair the effects of some past overtopping or washing.

UPSTREAM SLOPE. A masonry wall about two feet high above the water level extends all around the slope and past both abutments. Above this wall, the slopes vary from 1V on 3H to 2H or steeper. Small jugs are located two to four feet above the wall near the east abutment. Some slight sloughing has occurred here. At the bend just north of the spillway, stones have been washed out of the wall and the wall has been undermined by wave action. Some caving has occurred above the wall. Just west of the bend, a longitudinal crack was found a foot or so above the wall. About 20 feet west of the bend, there is a hole in a repaired section behind the wall which had been backfilled with sand. Another slump has occurred about 75 feet to the west This has also been repaired. The slope above has slumped badly. There are holes in the sand backfill behind the wall. This sand was used in the repair. This condition extends westward about 25 feet. About 200 feet on to the west, an eight inch stump is protruding from the side of the wall. Sloughing extends from here virtually to the west abutment. A house abuts on the embankment west of the center of the dam. There is bad sloughing of the upstream slope here. Small pipes extend from the house through the embankment, discharging on the upstream slope. There was no discharge at the time of the inspection.

West of the house, an eight inch pipe serves as a culvert. Vines and another stump are growing in the side of the wall here.

ABUTMENTS. No signs of erosion at the contact of the embankment with either abutment were found. The masonry wall extends beyond the west abutment and around three sides of an embayment in the pool at this abutment.

DOWNSTREAM SLOPE. The downstream slope appears to be about 1V or 3H. It is well covered with grass and appears generally smooth. One 24 inch tree was noted on the slope, east of the house. Some rilling was found under the grass, which does not appear to be serious, although its extent was difficult to determine because of the grass cover and the dead grass from the last mowing. Near the center of the embankment and on the north side of the road that parallels the dam, the conduit discharge was found, controlled by a six inch valve. The valve leaks slightly, forming a small pool of water. The ditch into which the conduit discharges was dry and well covered with grass. This ditch heads north to Winchester Road. East of the conduit and downstream from the wide, repaired section that was mentioned about under the head "Crest", the slope is steeper than elsewhere, apparently from dumping additional fill on the downstream slope. This is all covered with grass. From a point about six feet above the road to 10 to 12 feet above, water is seeping from the face and the ground is soft and very wet. The seep is difficult to see because it is covered with long, dead grass from mowing, as well as with a good live grass cover. The amount of water seeping is removed by evaporation before it can reach the toe of the dam. At the upper end of this seep, which is at the bottom of the additional fill placed on the slope, there is a depression. Otherwise, no signs of erosion from the seepage were found. The wet area is

only three or four feet wide parallel to the axis of the dam. The repaired section extends about 30 feet parallel to the axis. There is some sloughing in the top six feet of the slope.

RECOMMENDATIONS. Efforts to repair or drain the seep on the downstream slope can do more harm than good, unless a major project is undertaken. Such a project is not warranted at this time. As long as no major erosion, increased flow or sloughing is noted, repairs should be confined to filling depressions with free-draining sand. The area should be watched. If conditions worsen significantly, engineering assistance should be secured in formulating a repair program. There is a good chance that the condition here will heal itself if the upstream slope is treated.

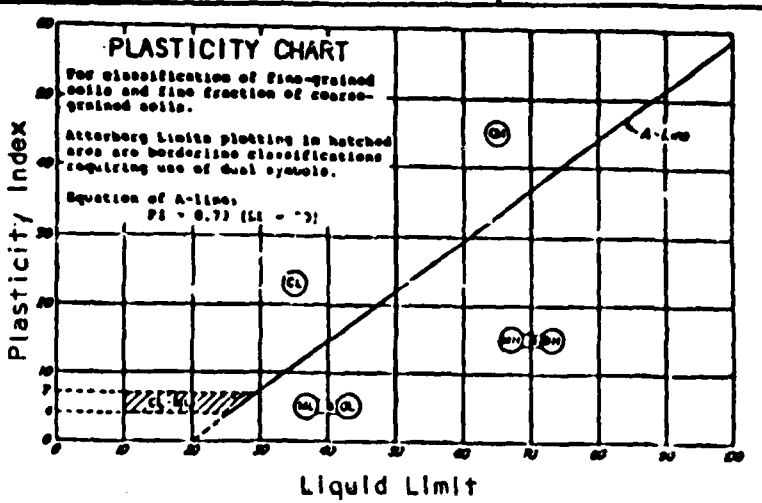
The upstream slope is deteriorating, but has a long way to go before any dangerous condition develops, except in the area south of the seep. Here, for a distance of some 50 feet on either side of the seep, some repairs will eventually be needed. We recommend lowering the pool about five feet, removing the wall and stockpiling the rocks, backfilling to a 1V on 3H slope, covering the slope with filter cloth and placing the rocks on the cloth. Additional rock or concrete fragments will be needed. These repairs should be done under engineering plans, specifications and supervision.
Report Submitted 4/6/81

F. H. KELLOGG
Registered Tennessee #3760

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay-mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

* Based on the material passing the 3-in. (75 mm) sieve

CLASSIFICATION CRITERIA		
Classification on basis of percentage of fines Less than 5% Pass No. 200 sieve GW, GP, SW, SP More than 12% Pass No. 200 sieve GM, GC, SM, SC 5% to 12% Pass No. 200 sieve Borderline Classification requiring use of dual symbols	$C_u = D_{60}/D_{10}$ Greater than 4 $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
	Not meeting both criteria for GW	
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	Atterberg limits plot above "A" line and plasticity index greater than 7	
	$C_u = D_{60}/D_{10}$ Greater than 6 $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
	Not meeting both criteria for SW	
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	Atterberg limits plot above "A" line and plasticity index greater than 7	



SOIL CLASSIFICATION CHART - ASTM D2487

FIGURE 1

APPENDIX E

HYDRAULIC AND HYDROLOGIC DATA

HYDRAULIC AND HYDROLOGIC CALCULATIONS

Nolan Dam is located Shelby County, Tennessee. The present land use is estimated to be 47 percent urban, 16 percent water, and 37 percent pasture. The soil is predominantly Grenada and is classified as a "C" soil. The runoff curve number was calculated to be 93.

The Nolan Dam is a small size, high hazard potential dam. As such, it is required to pass a ½ Probable Maximum Flood, (½ PMF), without overtopping. Using the U.S. Weather Service TP-40, the 6-hour PMP was estimated to be 29.8 inches yielding 28.92 inches runoff (RCN 93 AMC II). The ½ PMF which is derived from the Probable Maximum Precipitation was routed with a 14.46 inch runoff (RCN 93 AMC II).

The total inflow into the reservoir is about 67 acre-feet with a maximum peak of 532 cfs. Nolan reservoir has a maximum storage from the crest of the spillway to the top of the dam of 40 acre-feet and a maximum spillway discharge rate of 60.5 cfs. The impoundment is insufficient to safely pass the ½ PMF.

The 6-hour, 100-year flood containing 5.6 inches precipitation was routed through the dam using a RCN of 98 (AMC III). This produced a runoff of 5.37 inches and a routed peak discharge of 40 cfs. Nolan Dam contained the storm with flows of 2.3 feet in the emergency spillway and a freeboard of 1.9 feet.

The inflow hydrograph was calculated by methods contained in Section 4, Chapter 21, of the SCS National Engineering Handbook. Weir constants in the formula $Q=CLH^{3/2}$ were found in King and Brater "Handbook of Hydraulics", fifth edition. Pipe flow calculations for corrugated steel pipes were made using inlet control as found in the "Handbook of Steel Drainage and Highway Construction Products", 1973 printing. The routing equation used was:

$$I_1 + I_2 + \left(\frac{2S_1}{\Delta t} - O_1\right) = \left(\frac{2S_2}{\Delta t} + O_2\right) .$$

Basic Engineering Data was obtained from the following sources: Engineering surveys of the impoundment structure; U.S. Geologic Survey Topographic Maps; Aerial photographs; USDA Soil Conservation Service Soil Survey Maps; Rainfall Data and Hazard Classification from the Tennessee Division of Water Resources.

HYDRAULIC AND HYDROLOGIC SUMMARY

Frequency of Occurence	Duration	Antecedent Moisture Condition II	III
100-year	6-hour	Will Pass	Will Pass
100-year	10-day	---	---
½PMF[1]	6-hour	Will Overtop 0.2 Feet for 4 Hours	Will Overtop 0.25 Feet for 4.1 Hours
PMF	6-hour	Will Overtop 1.0 Feet for 5 Hours	Will Overtop 1.07 Feet for 5.1 Hours

[1]Probable Maximum Flood

FULL PMP (AMC II)

HYDROGRAPH COMPUTATION

DATE April 9, 1981
COMPUTED BY B.F.S.
CHECKED BY

Project Nolan Lake

DR. AREA 0.09 SQ. MI. STRUCTURE CLASS _____

T_c 0.49 HR. STORM DURATION 6 HR.

POINT RAINFALL 29.8 IN.

ADJUSTED RAINFALL:

AREAL : FACTOR - IN. _____

DURATION : FACTOR - IN. _____

RUNOFF CURVE NO. 93

Q 28.92 IN.

HYDROGRAPH FAMILY NO. 1

COMPUTED T_p 0.343 HR.

T_c 5.92 HR.

(T_c / T_p)

COMPUTED 17.26 ; USED 16

REVISED T_p 0.37

$q_p = \frac{484A}{REV.\ T_p} = 117.7$ CFS.

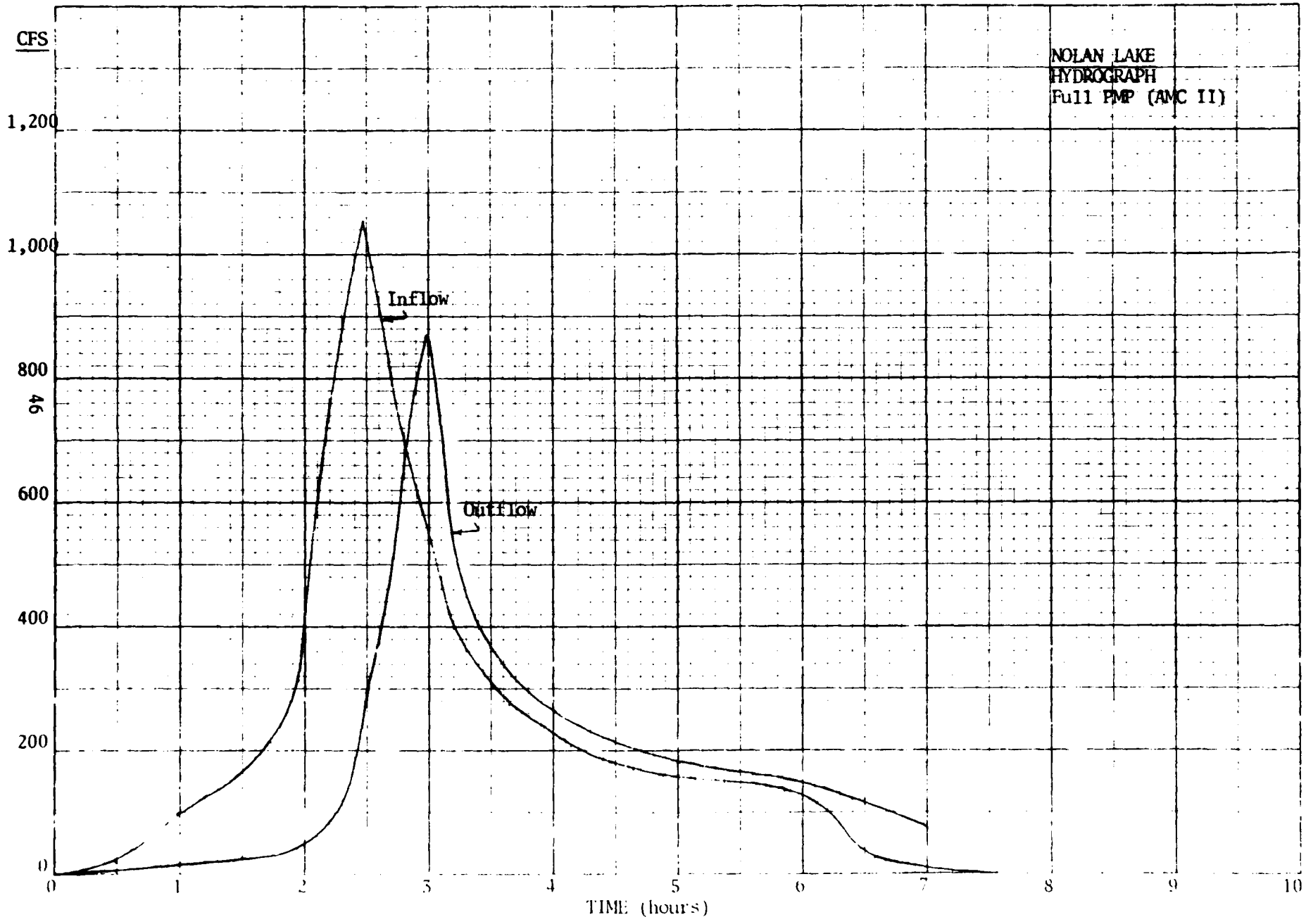
$(Q \times q_p) = 3404.7$ CFS.

t(COLUMN) = (t / T_p) REV. T_p q(COLUMN) = $(q_c / q_p) \times (Q \times q_p)$

Q(COLUMN) = $(Q_t / Q) \times Q$

	$t = (t/T_p)$ Rev. T_p	$q = (q_c/q_p) \times (Q \times q_p)$	$Q_t = (Q_t/Q) \times Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	0.24	3	
3	0.49	20	
4	0.73	51	
5	0.98	92	
6	1.22	126	
7	1.47	160	
8	1.71	211	
9	1.95	313	
10	2.20	759	
11	2.44	1052	
12	2.69	827	
13	2.93	582	
14	3.17	422	
15	3.42	330	
16	3.66	276	
17	3.91	238	
18	4.15	208	
19	4.40	187	
20	4.64	170	
21	4.88	160	
22	5.13	153	
23	5.37	150	
24	5.62	146	
25	5.86	136	
26	6.11	116	
27	6.35	68	
28	6.59	27	
29	6.84	14	
30	7.08	7	
31	7.33	3	
32	7.57	0	
33	check = 0.24 (7007)		= 28.97
34		645 (0.09)	O.K

Winsett-Simmonds Consulting Associates, Inc.
621 SOUTH DANIELDALE STREET P. O. BOX [illegible] MEMPHIS, TENNESSEE 38104
TELEPHONE 901 274-6580
Systems Engineers


CFS
NOLAN LAKE
HYDROGRAPH
Full PMP (AMC II)
1,200
1,000
800
600
400
200
0
Inflow
Outflow
0
1
2
3
4
5
6
7
8
9
10
TIME (hours)

NAME OF PROJECT =NOLAN LAKE

STORM=FULL PMP
TIME INCREMENT IN HOURS = 0.5

TIME	I (CFS)	2S/DT-O	2S/DT+O	O(CFS)
0.00	0	0	0	0
0.50	21	9	21	6
1.00	100	98	139	16
1.50	165	307	363	28
2.00	400	783	872	44
2.50	1052	1639	2235	298
3.00	550	1502	3241	870
3.50	310	1624	2352	364
4.00	230	1638	2154	368
4.50	180	1622	2043	311
5.00	160	1601	1953	199
5.50	150	1585	1911	163
6.00	130	1568	1855	149
6.50	40	1512	1733	113
7.00	10	1412	1552	75

½ PMF (AMC II)

HYDROGRAPH COMPUTATION

DATE April 9, 1981
COMPUTED BY R.F.S.
CHECKED BY

Project Nolan Lake

DR. AREA 0.09 SQ. MI. STRUCTURE CLASS _____

T_c 0.49 HR. STORM DURATION 6 HR.

POINT RAINFALL 15.32 IN.

ADJUSTED RAINFALL:

AREAL : FACTOR - IN. _____

DURATION : FACTOR - IN. _____

RUNOFF CURVE NO. 93

Q 14.46 IN.

HYDROGRAPH FAMILY NO. 1

COMPUTED T_p 0.343 HR.

T_o 5.86 HR.

(T_o / T_p):

COMPUTED 17.08 ; USED 16

REVISED T_p 0.366

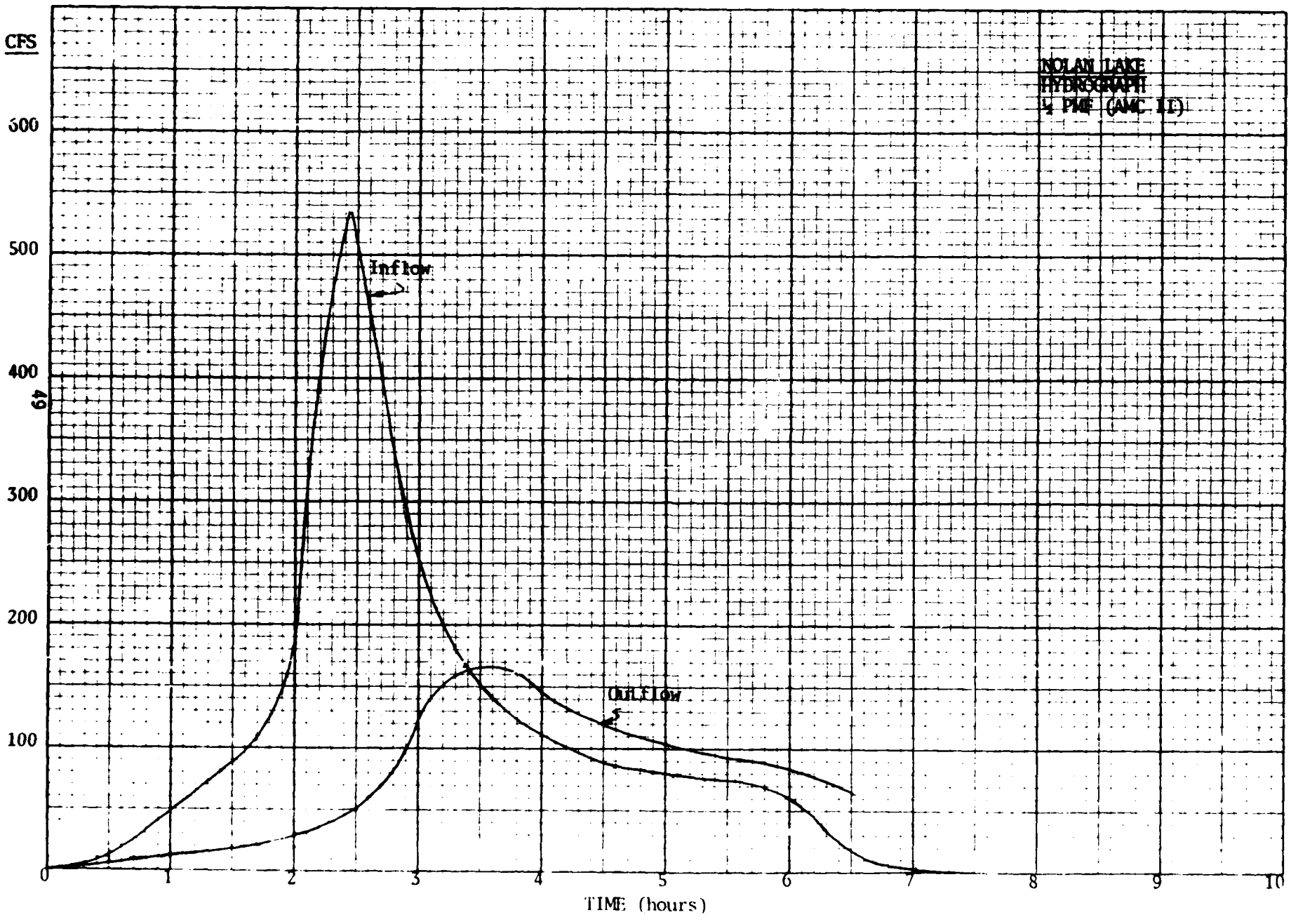
$q_p = \frac{484A}{\text{REV. } T_p} = 119.02$ CFS.

$(Q)(q_p) = 1720.98$ CFS.

q(COLUMN) = (t / T_p) REV. T_p q(COLUMN) = $(q_c / q_p)(Q)(q_p)$

Q(COLUMN) = $(Q_t / Q)Q$

	$t=(t/T_p)$Rev. T_p	$q=(q_c/q_p)(Q)(q_p)$	$Q_t=(Q_t/Q)Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	0.24	2	
3	0.48	10	
4	0.72	26	
5	0.97	46	
6	1.21	64	
7	1.45	81	
8	1.69	107	
9	1.93	158	
10	2.17	384	
11	2.42	532	
12	2.66	418	
13	2.90	294	
14	3.14	213	
15	3.38	167	
16	3.62	139	
17	3.86	120	
18	4.11	105	
19	4.35	95	
20	4.59	86	
21	4.83	81	
22	5.07	77	
23	5.31	76	
24	5.56	74	
25	5.80	69	
26	6.04	59	
27	6.28	34	
28	6.52	14	
29	6.76	7	
30	7.01	3	
31	7.25	2	
32	7.49	0	
33	check: 0.24 (3543)		= 14.64
34	645 (0.09)		O.K


CFS
600
500
400
300
200
100
0
1
2
3
4
5
6
7
8
9
10
TIME (hours)
Inflow
Outflow
NOLAN LAKE
HYDROGRAPH
¼ PMF (AMC II)

NAME OF PROJECT =NOLAN LAKE

STORM=1/2 PMP
TIME INCREMENT IN HOURS = 0.5

TIME	I (CFS)	2S/DT-O	2S/DT+O	O (CFS)
0.00	0	0	0	0
0.50	11	2	11	4
1.00	48	40	81	11
1.50	88	138	175	1[illegible]
2.00	190	356	41[illegible]	[illegible]
2.50	532	979	10[illegible]	[illegible]
3.00	850	1523	1781	[illegible]
3.50	151	1590	19[illegible]	[illegible]
4.00	111	1563	1862	[illegible]
4.50	90	1525	17[illegible]	[illegible]
5.00	80	1490	16[illegible]	[illegible]
5.50	75	1462	1643	[illegible]
6.00	60	1434	15[illegible]	[illegible]
6.50	19	1381	1513	[illegible]

100 YEAR (AMC III)

HYDROGRAPH COMPUTATION

DATE April 1, 1981
COMPUTED BY E.F.S.
CHECKED BY

Project Nolan Lake

DR. AREA 0.09 SQ. MI. STRUCTURE CLASS _____

T_c 0.19 HR. STORM DURATION 6 HR.

POINT RAINFALL 5.6 IN.

ADJUSTED RAINFALL:

AREAL : FACTOR - IN. _____

DURATION : FACTOR - IN. _____

RUNOFF CURVE NO. 98

Q 5.37 IN.

HYDROGRAPH FAMILY NO. 1

COMPUTED T_p 0.343 HR.

T_o 5.9 HR.

(T_c / T_p):
COMPUTED 17.20 ; USED 16

REVISED T_p 0.369

$q_p = \frac{484A}{REV.\ T_p} = 118.05$ CFS.

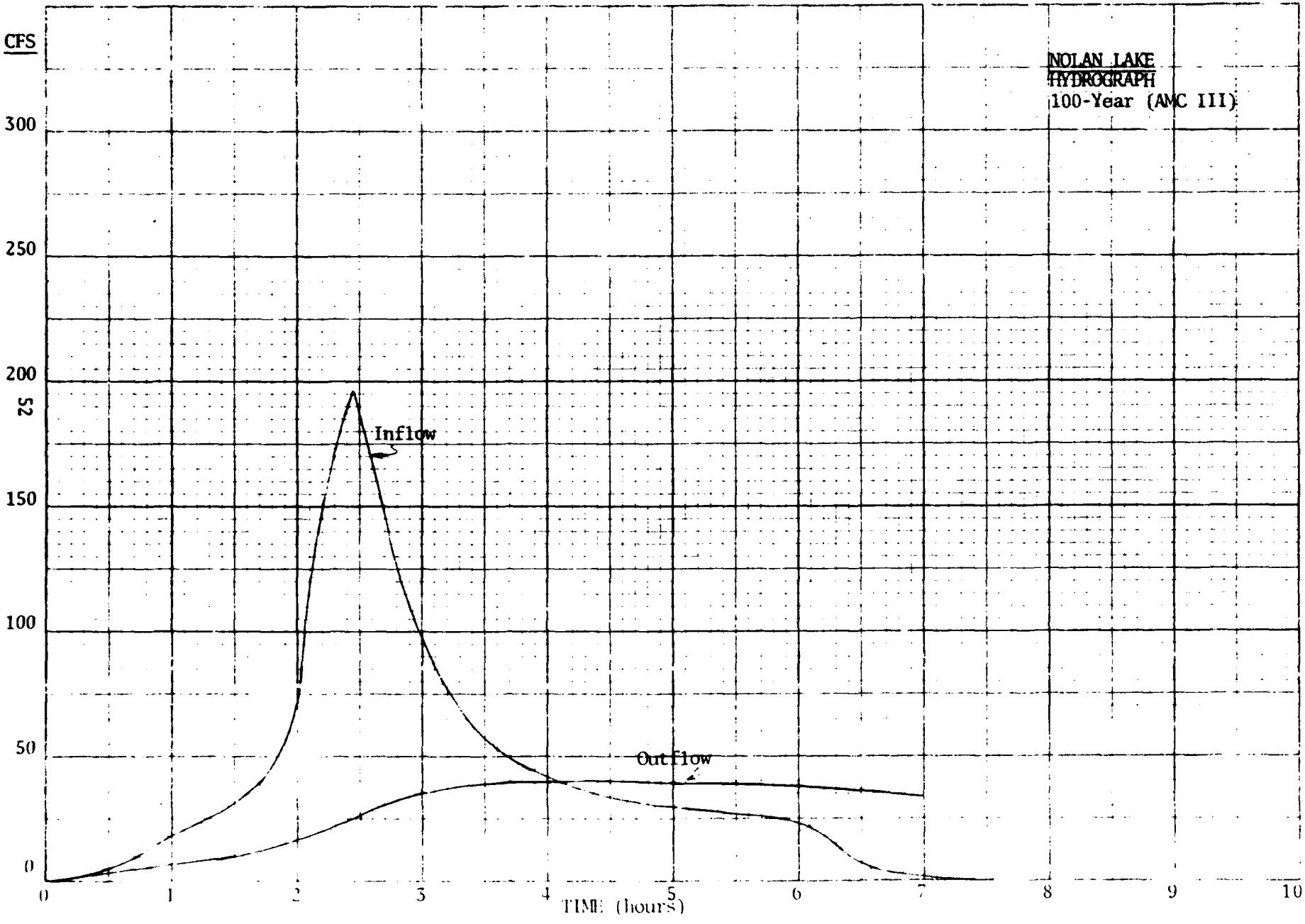
$(Q)(q_p)$ = 633.92 CFS.

t(COLUMN) = (t / T_p) REV. T_p q(COLUMN) = $(q_c / q_p)(Q)(q_p)$

Q(COLUMN) = $(Q_t / Q)Q$

	$t=(t/T_p)$Rev. T_p	$q=(q_c/q_p)(Q)(q_p)$	$Q_t=(Q_t/Q)Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	0.24	1	
3	0.49	4	
4	0.73	10	
5	0.97	17	
6	1.22	23	
7	1.46	30	
8	1.70	39	
9	1.95	58	
10	2.19	141	
11	2.44	196	
12	2.68	154	
13	2.92	108	
14	3.17	79	
15	3.41	61	
16	3.65	51	
17	3.90	44	
18	4.14	39	
19	4.38	35	
20	4.63	32	
21	4.87	30	
22	5.11	29	
23	5.36	28	
24	5.60	27	
25	5.84	25	
26	6.09	22	
27	6.33	13	
28	6.58	5	
29	6.82	3	
30	7.06	1	
31	7.31	1	
32	7.55	0	
33	check; 0.24 (1306)		= 5.39
34	645 (0.09)		B.K

Winsett-Simmonds, Consterdine & Associates, Inc.
821 SOUTH BARKSDALE STREET P. O. BOX [illegible] MEMPHIS, TENNESSEE 38104
TELEPHONE 901 274-0400
Systems Engineers

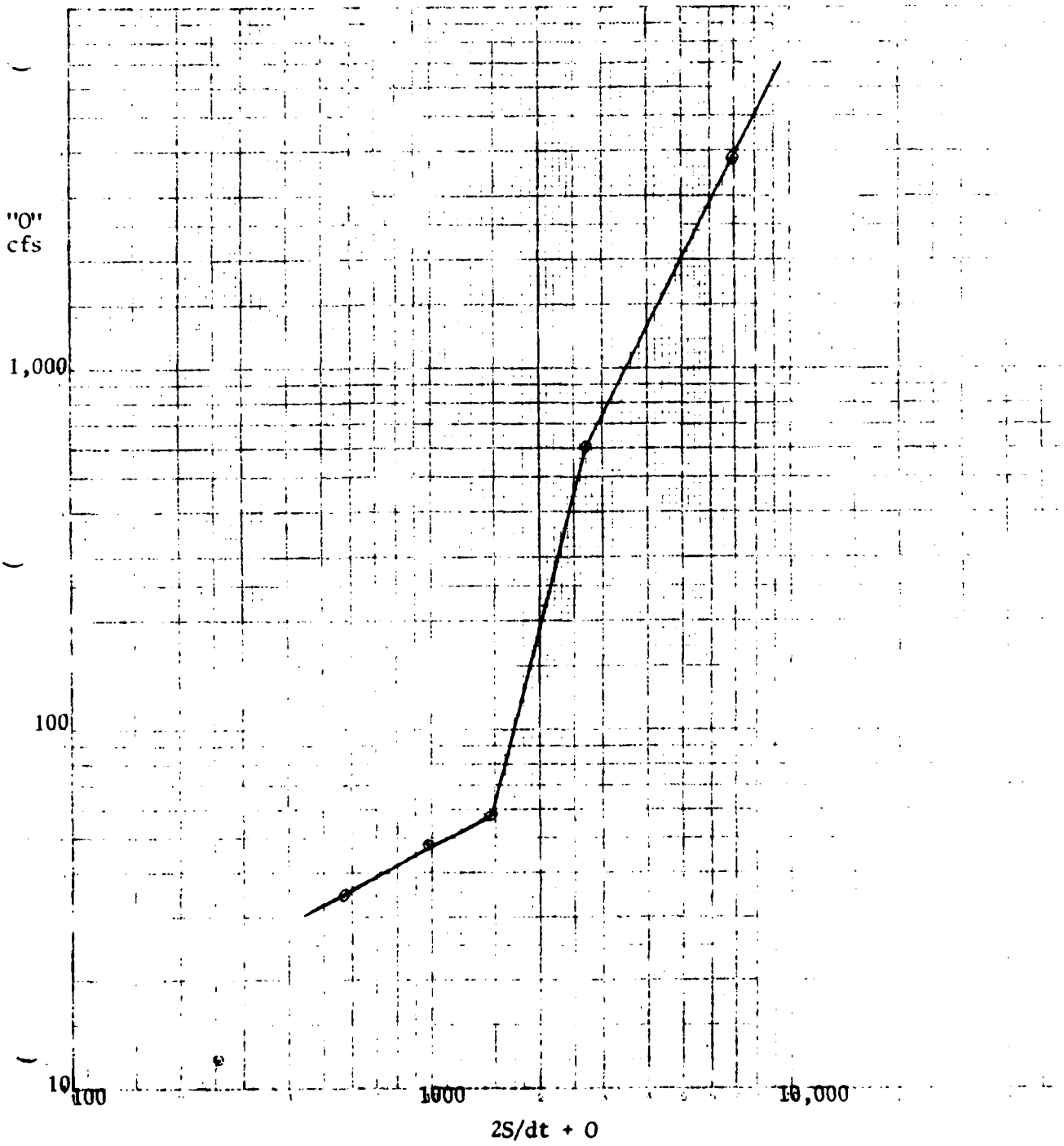

CFS
NOLAN LAKE
HYDROGRAPH
100-Year (AMC III)
300
250
200
150
100
50
0
Inflow
Outflow
0
1
2
3
4
5
6
7
8
9
10
TIME (hours)

NAME OF PROJECT =NOLAN LAKE

STORM=100 YEAR
TIME INCREMENT IN HOURS = 0.5

TIME	I (CFS)	2S/DT-O	2S/DT+O	O(CFS)
0.00	0	0	0	0
0.50	5	-1	5	3
1.00	18	10	22	6
1.50	31	38	59	10
2.00	70	106	139	17
2.50	196	315	373	28
3.00	97	535	609	37
3.50	58	612	679	34
4.00	42	632	713	41
4.50	34	628	733	43
5.00	30	614	692	39
5.50	26	592	673	39
6.00	24	567	642	38
6.50	7	525	598	36
7.00	1	465	533	34

STORAGE INDICATION CURVE
Nolan Lake



****
POWER CURVE FIT EQUATION
****

PROJECT = NOLAN LAKE 1ST. LINE

Y=A*X↑B

A = 1.18010797

B = 5.36024E-01

COEF. OF DETERMINATION= 0.995

****

****
POWER CURVE FIT EQUATION
****

PROJECT = NOLAN LAKE 2ND. LINE

Y=A*X↑B

A = 3.59968E-11

B = 3.85699E+00

COEF. OF DETERMINATION= 1.000

****

****
POWER CURVE FIT EQUATION
****

PROJECT = NOLAN LAKE 3RD. LINE

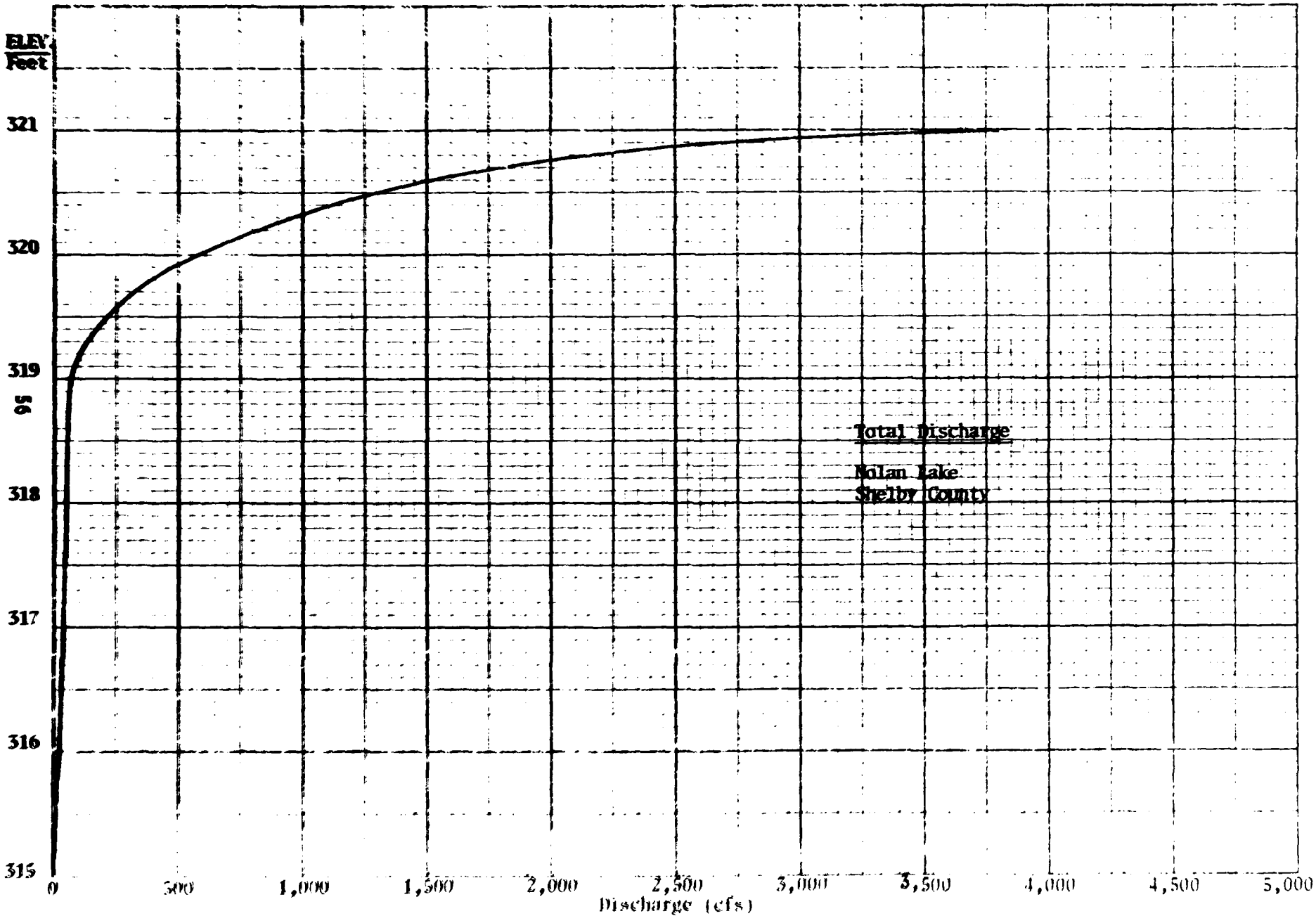
Y=A*X↑B

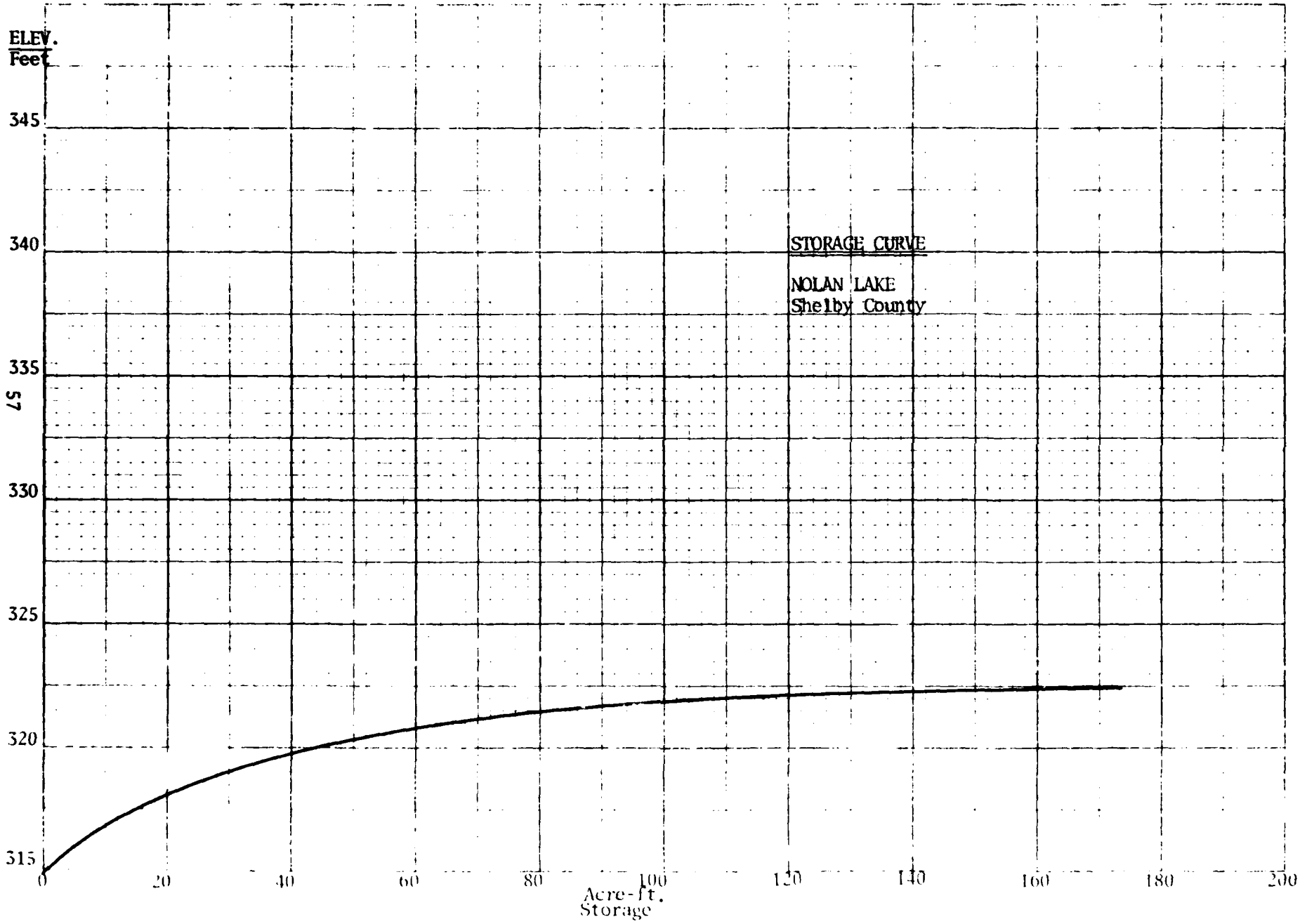
A = 1.42156E-04

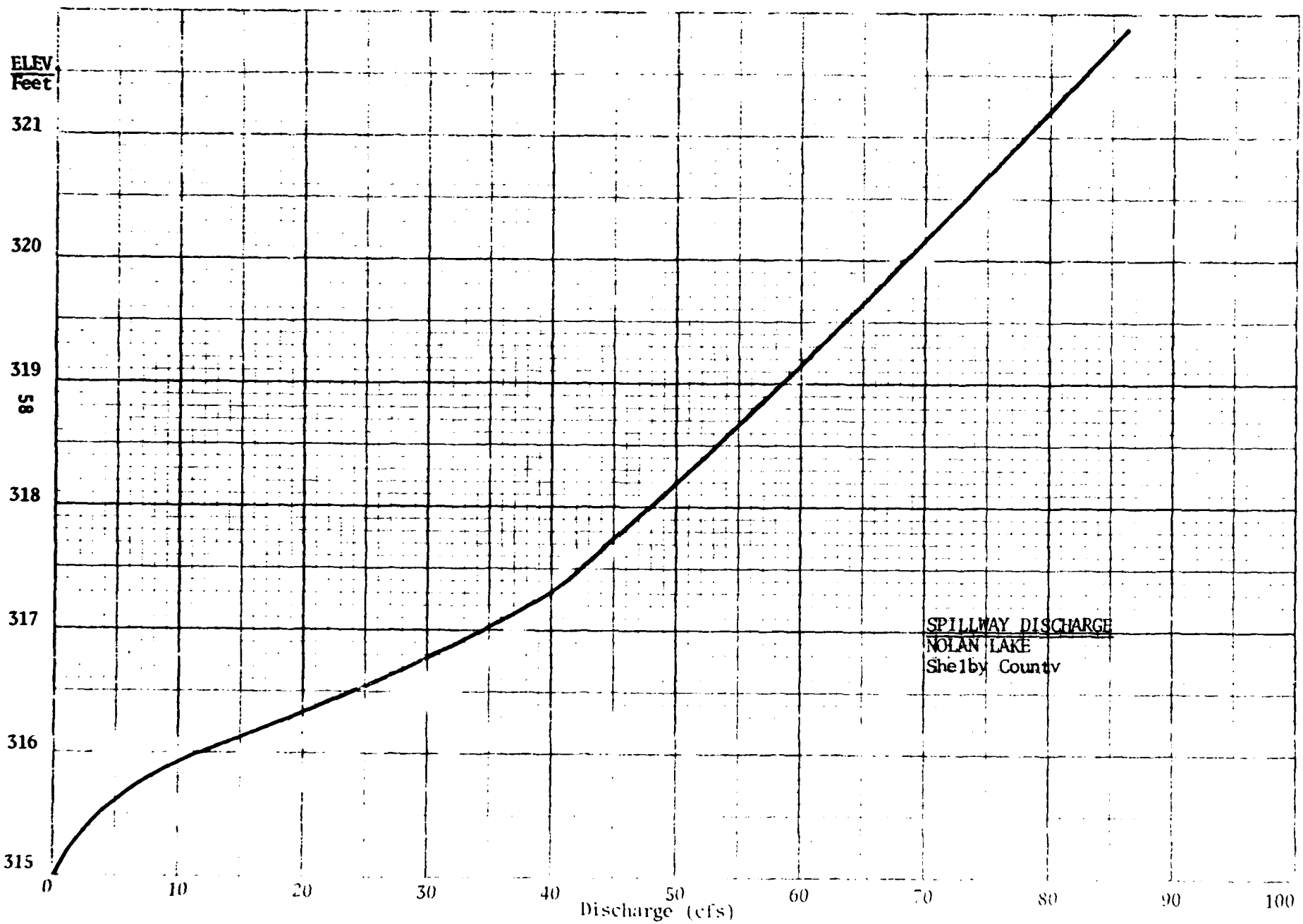
B = 1.93313E+00

COEF. OF DETERMINATION= 1.000

****


ELEV.
Feet
321
320
319
318
317
316
315
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
Discharge (cfs)
Total Discharge
Nolan Lake
Shelby County


ELEV.
Feet
345
340
335
330
325
320
315
STORAGE CURVE
NOLAN LAKE
Shelby County
S7
0
20
40
60
80
100
120
140
160
180
200
Acre-ft.
Storage


ELEV
Feet
321
320
319
318
317
316
315
0
10
20
30
40
50
60
70
80
90
100
Discharge (cfs)
SPILLWAY DISCHARGE
NOLAN LAKE
Shelby County

APPENDIX F

DAM INVENTORY DATA SHEET

DAM INVENTORY DATA SHEET
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

ID NUMBERS STATE(ID): 79-7041 FEDERAL(FED ID): TN-15741
NAME(PROJECT): Nolan Lake REGION(R): West
OWNER(S): Mrs. J. J. Nolan
ADDRESS: 3700 Ross Road, Memphis, TN 38117
TELEPHONE RESIDENCE: 363-1489 BUSINESS:
COUNTY: Shelby QUAD: Germantown-409SE
LOCATION LATITUDE: 32° 02 ' 53 ", LONGITUDE: 89° 50'- 11"
STREAM(SOURCE): Trib Nonconnah Ck Ofstrm RIVER MILE: BASIN: 44C
PURPOSE OF DAM: Recreation YEAR COMPLETE: 1946
CONTRACTOR(CONT): Mr. Cook LOCATION: Whitehaven, TN
ENGINEER(ENG): Unknown LOCATION:
TYPE OF DAM(TYC): Earth SIZE CLASSIFICATION: Small
DOWNSTREAM HAZARD POTENTIAL CLASSIFICATION STATE(H) 1 FEDERAL(FH) High
CERTIFICATE EXPIRATION DATE(EXP DATE):
STRUCTURAL HEIGHT(SHT): 14.7 FEET, HYDRAULIC HEIGHT(HHT): 10.5 FEET
CREST LENGTH(LGTH): 640 FEET, CREST WIDTH(WDTH): 12 FEET
UPSTREAM SLOPE(U/S): 2.3 :1, DOWNSTREAM SLOPE (D/S): 2.6 :1
POOL AREA NORMAL(NSURF): 8.44 ACRES, MAXIMUM(M/SURF): 9.28 ACRES

	ELEVATION(FEET MSL),	STORAGE CAPACITY(ACRE-FEET)
TOP OF DAM	(ELEV1) 319.2 ,	(TO/STR) 68.1
EMERGENCY SPILLWAY CREST	(ELEV2) 315.0 ,	(EM/STR) 40
NORMAL POOL	(ELEV3) 314.9 ,	(N/STR) 28.1

EMERGENCY SPILLWAY MATERIAL(ESM) Veg earth , SIZE(SZ) 7'
SERVICE SPILLWAY MATERIAL(SSM) N/A , SIZE(SZ) N/A
DRAINAGE AREA(DA): .09 SQ. MILES, CURVE NUMBER(CN): AMCII
TIME OF CONCENTRATION(TC): .99 HOURS, MAXIMUM 6-HR RAIN: 29.8 INCHES
COMMENTS: INVENTORIED BY: Privett DATE: 7/14/81
REVISED BY: DATE: D/S HAZARD BY: DATE:
OTHER NAME OF PROJECT: POOL AREAS OBTAINED BY: Quad
OTHER CONTACT AT DAM: Malcolm Holmes, Mgr. PHONE:
DATA OBTAINED FROM: Phase I investigation
EMER. SPIL. DESC.: Rectangular earth channel with a bot wid of 7'
SERV. SPIL. DESC.: N/A
ELEVATIONS REF. TO: Top of the west ES APPROX ELEV: FT MSL
DRAWDOWN DRAIN: MATERIAL: Iron pipe SIZE: 4" ELEVATION:
OTHER COMMENTS:

APPENDIX G

HAZARD POTENTIAL

AND

CONDITION CLASSIFICATION DEFINITIONS

TENNESSEE DEPARTMENT OF CONSERVATION

DIVISION OF WATER RESOURCES

DAMAGE POTENTIAL CATEGORY*

Category	Description
1.	Dams located where failure would probably result in any of the following: loss of human life; excessive economic loss due to damage of downstream properties; excessive economic loss, public damage to roads or any public or private utilities.
2.	Dams located in predominantly rural or agricultural areas where failure may damage downstream private or public property but such damage would be relatively minor and within the general financial capabilities of the dam owner. Public hazard or inconvenience due to loss of roads or any public or private utilities would be minor and of short duration. Chances of loss of human life would be possible but remote.
3.	Dams located in rural or agricultural areas where failure may damage farm buildings or agricultural land but such damage would be more or less confined to the dam owner's property. No loss of human life would be expected.

* Tennessee Department of Conservation, Division of Water Resources, Rules and Regulations Applied to the Safe Dams Act of 1973. Chapter 0400-4-1.

DEPARTMENT OF THE ARMY

OFFICE OF THE CHIEF OF ENGINEERS

HAZARD POTENTIAL CLASSIFICATION*

Category	Loss of Life	Economic Loss
Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than few	Excessive (Extensive community, industry or agriculture)

*U.S. Army Corps of Engineers, Recommended Guidelines for Safety Inspection of Dams.

DEFINITION OF CONDITION CLASSIFICATION

"Unsafe - Emergency" - A dam in a state of imminent failure. State and local authorities and downstream residents should be advised immediately, reservoir drained, or combination of the above (e.g., advanced piping, major slope instability, recent sudden collapse of a portion of the foundation, imminent overtopping, etc.).

"Unsafe - Nonemergency" - A dam with obviously serious deficiencies which clearly could develop, or are developing, into failure modes but do not yet pose the threat of imminent failure. State and local authorities should be advised promptly and remedial work should begin as soon as practical. Someone should be assigned to periodically check on the dam's condition until remedial work is begun. Drawing down the reservoir should be considered, e.g., flowing seepage from embankment which could lead to piping, evidence of solution channels or cavitation in the foundation, seriously inadequate spillway capacity as per ETL 1110-2-234, history of recurring slope instability, etc.).

"Significantly Deficient" - A dam with deficiencies which, if left unchecked, would likely become serious deficiencies and could ultimately result in failure. Advise State authorities and recommend remedial work be scheduled in time to prevent substantial further deterioration of the condition(s)--usually within six months to a year or sooner (e.g., heavy growth of sizeable trees on slopes, potentially serious erosion, spillway discharge channel too close to embankment, etc.).

"Deficient" - A dam with deficiencies which need attention but which would not likely effect the safety of the dam unless left unchecked for a long period of time. Advise State authorities and recommend remedial action at owner's convenience but before the problem can escalate into a significant deficiency (e.g., brush and/or few or very small trees on embankment, long term deterioration of masonry or metal outlet features, formation of deep ruts in embankment roadway, deterioration of riprap, etc.).

"Not Deficient" - Well constructed and maintained dam with no apparent deficiencies relative to its safety and structural integrity.

APPENDIX H

CORRESPONDENCE

ORNED-G

NON-FEDERAL DAM INSPECTION REVIEW BOARD
PO BOX 1070
NASHVILLE, TENNESSEE 37202

Commander, Nashville District
US Army, Corps of Engineers
PO Box 1070
Nashville, TN 37202

1. The Interagency Review Board, appointed by the Commander on 19 June 1981, presents the following recommendations after meeting on 16 July 1981, to consider the Phase I investigation report on Nolan Dam performed by Winsett-Simmonds, Consterdine & Associates, Inc., under contract to the Tennessee Department of Conservation.

2. A recommendation should be added for the owner to clean out the debris in the spillway and outlet channel immediately.

3. The valve control on the 4-inch draw down pipe should be moved to the upstream end so that full reservoir pressure is not present in the pipe beneath the embankment.

4. The Board is in agreement with other report conclusions and recommendations following minor revisions.

FRANK B. COUCH, JR.
Chief, Geotechnical Branch
Chairman

BOBBY G. MOORE
Assistant State Conservation Engineer
Alternate, Soil Conservation Service

EDMOND B. O'NEILL
Alternate, Division of Water Resources
State of Tennessee

THOMAS N. PORTER
Hydraulic Engineer
Alternate, Hydrology and Hydraulics Branch

EDWARD B. BOYD
Hydrologic Technician
Alternate, US Geological Survey

BRADLEY B. HOOT
Chief, Structural Section
Alternate, Design Branch

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202

IN REPLY REFER TO

31 JUL 1[illegible]

ORNED-G

Honorable Lamar Alexander
Governor of Tennessee
Nashville, TN 37219

Dear Governor Alexander:

Please be informed of the results of an inspection, under authority of Public Law 92-367, conducted on Nolan Dam in Shelby County, Tennessee. An inspection team, composed of personnel from Winnsett-Simmonds, Consterdine and Associates, Inc., and a member of your Division of Water Resources, observed conditions which indicate a high potential for failure of the embankment dam due to seriously inadequate spillway capacity and other serious deficiencies.

Nolan Dam is classified as a high hazard potential, small size dam and, as such, should be able to regulate at least a one-half probable maximum flood (1/2 PMF) to conform to inspection program guidelines. A hydraulic analysis of the project's spillway showed the dam would be substantially overtopped by a one-half probable maximum flood. A visual inspection also indicated that the stability of the upstream slope is questionable due to wave erosion and sloughing.

Based on the results of the visual inspection and due to the seriously inadequate spillway capacity, the dam is considered unsafe. While I do not view this as an emergency at this time, I recommend you initiate prompt action by the State to cause the owner to correct the deficiencies as soon as practical to minimize the risk to the subdivision located downstream.

A report of the technical investigation will be furnished your office upon completion.

Sincerely,

LEE W. TUCKER
Colonel, Corps of Engineers
Commander

CF:
Mr. Robert A. Hunt, Director
Division of Water Resources
4721 Trousdale Drive
Nashville, TN 37220


ATE
LME